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The American

GAS LIGHT JOURNAL.

(ILLUSTRATED.)

DEVOTED TO THE INTERESTS OF

ILLUMINATION, HEATING, MECHANICAL, CHEMICAL

AND

GENERAL SCIENCE.

VOLUME LXXXIV.

(FORTY-EIGHTH YEAR.)

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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF EDITOR, WRINKLE DEPARTMENT,
MILWAUKEE, WIS., Oct. 25, 1905.

To the Members of the Western Gas Association: The next meeting of the Western Gas Association will in all probability be the last one, owing to the proposed merging of the three leading gas associations. Therefore, every effort should be made to make it a rousing success in all respects, and it falls to my lot as Editor of the Wrinkle Department to again appeal to you for this department. I earnestly request those who have made promises of contributions to remember such as soon as possible, and I fully expect to hear from quite a number who have not made any promises, but who I know are in possession of something that would prove of value to the Wrinkle Department.

Yours very truly, B. MCADAM, Editor.

[NOTICE.]

Wrinkle Department, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE WRINKLE DEPT.,
719 CITIZENS BUILDING,
CLEVELAND, O., June 13, 1905.

The Wrinkle Department of the Ohio Gas Light Association is now ready to receive contributions for the 1906 collection, and a sketch or description of all devices, formulæ and methods of accomplishing objects pertaining to the gas business, is respectfully solicited.

Please send a written explanation, accompanied by any sketch, photograph or drawing, to the above address, or a description alone will suffice.

Hoping to receive prompt compliance,

Yours very truly, W. E. STEINWEDELL, Editor.

BRIEFLY TOLD.

SEND IN YOUR ORDERS FOR THE RESEARCH COMMITTEE'S REPORT.—We understand that the demand for the report of the Committee on Research, covering the standards for pipe castings and specials, which report was adopted last October at the Milwaukee meeting of the American Gas Light Association, has exhausted the supply of pamphlets. In order to supply the demand, the Secretary, Mr. George G. Ramsdell, informs us that he has prepared complete sets of drawings of a desirable size which he is furnishing at prices shown in our advertising columns.

NOTES—

"T. J. C.," writing from Hartford, Conn., under recent date, says: "Judging by the amount of vapor which some disgruntled ones of Norwich, Conn., are blowing through the press of that town, our mutual friend, Judge Thayer, must be putting them out of countenance with the public by his able and conscientious upholding of the interests of the community at large. In such a matter the Judge can well afford to be complacent, while the vapors evaporate and so make not even record in space."

WE regret to announce the death of Mr. John Leetch, General Manager of the Washington (D. C.) Gas Light Company. In due time we will print some record of his life's work.

MR. HENRY A. TENNEY, died at his home in Everett, Mass., the afternoon of December 27th. He was prominent in the management of the Suburban Gas and Electric Company, of Revere, Mass., and also in the affairs of the Malden (Mass.) Electric Company. He was born in Chelsea, Mass., July 26th, 1840, and was well-known in the banking circles of Massachusetts.

MISSOULA, MONT., is to have a gas works, a franchise on such account having been granted to Dr. Joseph Oettinger by the Council, which action was sustained at a special election of the residents held the 18th of December. Under the grant the grantees may charge $2.50 per 1,000 for gas sold on illuminating account, the rate on fuel account to be $1.75. The Oettinger contingent say they will expend $150,000 in Missoula before the works are completed.

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Industrial Journalism Up-to-Date.

Here is something the virtue and value of which are accredited to the editorial staff of *Iron Age*.

The "perils of prosperity" are not confined to the tendency to boom prices which invites reactions and to the evils of over-expansion in industry and over-inflation in finance. There is also the peril to which the reader of current industrial news is subjected at the hands of the facile manufacturers of prosperity literature. Ever since the Wall Street prophets of prosperity began their newspaper campaign in the summer of 1904, at the same time putting up prices of stock in anticipation of the good things that have come since in quantity more than justifying their predictions, the record of industrial developments has been an increasingly popular feature of the daily newspapers. Some of the output of the writers on these subjects is accurate and creditable. Much is inaccurate and misleading.

But whether good, bad or indifferent, it is the thing to print prosperity news; and if the reader of it be not able from his knowledge of the industry handled to sift the wheat from the chaff he is apt to carry away a wonderful jumble of fact and fancy from his half hour with the morning paper. A cipher or two seems not to count for much with some of these writers. One is led to think, indeed, judging from what is published about iron and steel, that the theory of the writer is that every normal day of these piping times must yield up orders for several thousand cars, a few hundred locomotives, a hundred thousand tons or so of rails, not omitting bridge and other structural work to the amount of, say, 10,000 tons, with anywhere from 20,000 to 50,000 tons of pig iron taken by some large consumer or about to be taken. It is interesting to note the regularity with which, in a most indefinite and uncircumstantial way, announcements of purchases of iron and steel and of equipment into which these enter appear in some of the prosperity columns. It almost suggests that the manufacture of such information in assorted lots cut to length is one of the latest departures in journalism. As an example of the new method we take the following from two of the past week's issues of a leading New York paper:

New sources of supply of specular iron ore and ferromanganese of high grade have been found in North Africa. * * * The estimated output of pig iron from all the furnac s in the country for this month is 1,956,833 gross tons. This output is about 4 per cent. below the returns for November, and is accounted for by the number of furnaces North and South which are blown in for repairs. Twenty-eight new furnaces, which will average a daily output of 750 tons each, are under construction, and at least 50 furnaces of a new type for open hearth products, and which will average 500 tons a day each, are under contract for the Southern field.

Twenty-seven steel working plants in this city are increasing the capacity of their works and seven concerns are building blast furnaces so as to make every part of their products, from the pig iron to the highest grade of machinery steel. One local steel working firm is expending $3,000,000 on a structural steel plant which will be within 6 months as complete as any of the largest plants in the West. Another large steel working plant is planned for Brooklyn that will manufacture from the iron ore to the best kinds of machinery steel.

For railroad rolling stock the markets are glutted with orders, including 1,000 locomotives, 80,000 freight cars, 16,000 passenger cars and immense amounts of structural steel for bridges, sheds and stations. Provision has been made for the busy times ahead by the investment of about $180,000,000 by the steel makers and workers in new plants and in additions to and improvements of existing plants, all of which will be completed within 3 or 4 months. Contracts to the amount of $500,000,000 for buildings in which structural steel will be largely used call for the erection of these buildings within the coming year. Accepted plans now on the boards of local architects and engineers will require for delivery within a year about 350,000 tons of structural steel.

The completion of the 180 odd millions' worth of plant into which the steel workers of the country have been putting their recent savings and the 27—actual count—steel works in New York city that have added to capacity lately may force the North African excavators of ferromanganese to work overtime. But that would only be another incident of our unbounding prosperity. It is hard to know whether to admire most, on the one hand, the scrupulous exactness of the blast furnace statistics for December, published 10 days before the end of the month, or the roundness and liberality, on the other hand, of the figures representing new building contracts. Minuteness and breadth of imagination are not often so well combined in statements of this sort. Indeed the statistical facility of the article—perhaps felicity is the word—constitutes its chief charm.

[Abstract—Continued from Vol. LXXXIII., Page 1058.]

PROCEEDINGS, THIRTY-THIRD ANNUAL MEETING, AMERICAN GAS LIGHT ASSOCIATION.

Held in the Hotel Pfister, Milwaukee, Wis., October 18–20, 1905.

Second Day—Afternoon Session.

The President introduced Mr. James S. McIlhenny, of Washington, D. C., who read his paper entitled

SOME THOUGHTS ON CONDENSATION.

[For the text of Mr. McIlhenny's paper, see Journal, Nov. 20th, 1905, p. 836.]

Discussion.

The President, in inviting discussion on the paper, expressed the hope that the debate would be a brisk one.

Mr. E. H. Earnshaw thought Mr. McIlhenny had pointed out very clearly the common lack of attention paid to the important subject of condensation, and he thought all would agree with him that the subject was one that would well repay any care and study devoted to it. The speaker was much interested in the account of the condensation system at the West Station works, but believed that Mr. McIlhenny had not given sufficient credit to the part played by the relief holder in securing good condensation results. It had long been quite generally known that the relief holder is in water gas manufacture quite the most important part of the condensing apparatus, and he often wished to know what good result would be obtained by its use in connection with coal gas condensation. The necessity of employing a double set of exhausters had made it difficult to even experiment with the coal gas relief holder scheme, and coal gas engineers had used, as a somewhat inefficient substitute, large primary air condensers in which the speed of flow was checked and a large amount of tarry matter deposited, even though there might be comparatively slight reduction in temperature. Experience had demonstrated that as a tar extractor for water gas the relief holder was more efficient than any frictional apparatus placed immediately after the condensers. Some years ago the speaker conducted a series of experiments having in view the determination of the best method of removing tar from water gas, in the course of which experiments an apparatus was used in which the gas was passed through a series of perforated plates against impingement surfaces, on the principle of the P. & A. tar extractor. With the apparatus located at the inlet to purifiers, the temperature of the gas being from 105° to 110°, and using a sufficient number of perforated plates to completely remove the tar, it was found that the quantity of tar so removed was about 0.5 gallon per 1,000. At the inlet to condensers, the gas being 175°, the amount of tar removed by the same apparatus was insignificant. With the apparatus located at the outlet of the condensers the amount of tar removed was quite constant at different temperatures, about .12 gallon per 1,000, the quantity of uncondensed tar decreasing with each reduction in temperature until at about 90° the removal of tar was reasonably complete. With the temperature at 110° at the outlet of condensers the gas still contained not less than .20 gallon of tar per 1,000; at this same temperature at inlet to purifiers the amount of tar was only .02 gallon per 1,000, thus indicating the great value of the relief holder as a tar extractor. Mr. McIlhenny touched upon the removal of naphthaline, and the conclusions he reached were at variance with theory and with such experience as the speaker had had. With divisional or fractional condensation, the vapors were condensed approximately in the order of their vapor tensions, so that the tendency to naphthaline stoppages should be greatly increased by the early removal of the heavier vapors, as there was usually not enough tar with the same vapor tension as naphthaline to dissolve the deposited crystals and prevent solid obstruction from forming in the cooler portions of the condensing apparatus. His experience had convinced him that this was the chief objection to an otherwise sound and desirable practice. For this reason an apparatus for scrubbing the gas with an oil or tar free from naphthaline should be included in the condensation scheme, such apparatus being placed at a point where the temperature of the gas was about 100°, as at that temperature the naphthaline could be removed without loss of candle power. Elsewhere Mr. McIlhenny assumed that naphthaline would not be deposited in the absence of water vapor. Some years ago the presence of considerable quantities of naphthaline in the mains in the works with which the speaker was then connected led to his undertaking certain laboratory experiments with the view of ascertaining: First, whether illuminating gas reasonably free from the vapor of the naphthaline would pick up any naphthaline already deposited in the

mains, and whether naphthaline so picked up would be re-deposited on change of tem perature; second, the influence of the presence of naphtha vapor in the gas; third, the effect of temperature in both the above cases; fourth, w hether the absence of water vapor would prevent or retard the deposition of naphthaline. In these experiments the following conditions were obtained: Illuminating gas at a temperature of 90° F. was passed over naphthaline maintained at the same temperature and then suddenly cooled do wn to 45° F. The amount of naphthaline picked up, and the extent to which it was re-deposited on cooling, were observed. Similarly, gas at 50° F. was passed over naphthaline at 50° F., and then cooled as before to 45° F. The gas was then charged with naphtha vapor to the amount of ½ of a gallon of naphtha per 1,000, and the above experiments repeated. In the next series of experiments the gas was thoroughl y dried by passing it through tubes filled with calcium chloride and th en passed over naphthaline at the high temperature and low temperature, both with and without naphtha vapor, as before described. Consideration of the results obtained led to the following conclusions: That illuminating gas will pick up naphthaline already deposited in the mains, and that the amount so picked up will, to a great extent, be re-deposited on a sudden lowering of the temperature. That the presence of naphtha vapor in the gas will not increase its power of picking up naphthaline already deposited in the mains, but that it will assist in preventing it from being re-deposited on sudden lowering of the temperature. That whether the gas be charged with naphtha vapor or not, the facility with which it will pick up naphthaline varies directly with and is greatly influenced by the temperature. That thorough drying of the gas has no effect upon the amount of naphthaline picked up or re-deposited, and that this is true whether or not the gas is charged with naphtha vapor. This last conclusion was directly contrary to the idea almost universally entertained of the effect that drying the gas will have upon the deposition of naphthaline, but it simply went to show that the vapor of naphthaline was subject to the same laws and was deposited under the same conditions as any other vapor; that was to say, any vapor began to be deposited or condensed from an atmosphere charged wherewith whenever the temperature of the atmosphere was lowered below the dew point corresponding to the degree of saturation. The chief difference in the case of naphthaline was that it passed directly from the gaseous to the solid state, while all other vapors found in illuminating gas condensed to a liquid. Friction promoted the condensation of naphthaline in precisely the same way that friction promoted the condensation of tar, hence the tendency to form accummulations in elbows and bends. For the reasons stated, it was clearly evident that condensation of water vapor would always accompany the deposition of naphthaline, but this was because the conditions favorable to the deposition of naphthaline were even more favorable to the condensation of water vapor, and not, as was usually supposed, because the water carried the naphthaline down with it.

Mr. Rollin Norris sugg ested there was one thing that perhaps had better be put on the record. Mr. McIlhenny said that probably the temperature of the ground surrounding the gas mains did not vary very much at different seasons of the year, but such figures as Mr. Norris had would in dicate that in the climate of Philadelphia the range was from about 30° in winter to about 80° in summer.

Mr. Thomas D. Miller said he had been making some investigations on ground temperatures in New Orleans for the past 8 months. The soil there was saturated with water, and with a view of arriving at some conclusion in regard to naphthaline, he had a thermometer put in the ground last fall. He had not yet tabulated the results of the experiment, but the maximum change found from last winter, when the thermometer was below the freezing point, in the ground they found a temperature of 58, and this summer at the highest temperature of the atmosphere they had a temperature of 62, which showed that one did not have to bother very much with change in ground temperature. His idea was that the foundation was laid in the summer time for most of the naphthaline troubles that were found in the winter time. The gas left the holder in the summer time at a high temperature, and striking the cool pipes in the ground it passed down on the inner perimeter of the pipe. In the winter time the gas went out cool, entering the warm pipes and took up the naphthaline, carrying it along until it struck a cool pipe, where it was deposited. With that idea he had made an effort at Dallas to be relieved of a trouble which had been serious the previous winter, and worked against the deposit of naphthaline in their mains in the summer time, and instead of having 2,000 or 3,000 naphthaline complaints the next year, they had only 20. Carrying that out for 2 years, they had no trouble whatever with naphthaline in the winter time. He saw that Mr. Earnshaw in his remarks had very emphatically corroborated that theory. As to the subject of condensation in connection with high pressure work, last winter a year ago they laid all of their high pressure lines without any lie-bys or drips, and in a certain section at the lower end of the town, supplied almost exclusively by high pressure gas, without warning they had complaints coming in respecting the Welsbach burners. A little later on the complaints respecting ordinary burners piled up. Investigation showed a deposit on the long tube incandescent gas burners of a tarry matter, and on the short tubes, where the heat was high enough, a very good quality of black Japan. They cleaned the burners, but after they did that with a few lamps they found they would clog up the next night. In one case an arc lamp was cleaned and watched, and it was just 3 minutes until it stopped again. The complaint was general. They had out a force of men and found the fixtures were stopped up with the troublesome tarry deposit. He connected the trouble with naphthaline and provided the men with a little pump which they would pump into the house pipes and down through the riser, uutil they got clear gasoline, but in 3 or 4 days we had the same trouble. They put a wisp of cotton in a service pipe in a house just cleaned out, but at the end of 3 days the burners stopped up. The cotton came out clean and clear; not a stain was on it. The cotton placed in the same grade of burners showed some discoloration, but they got the discoloration on the Welsbach burners and in the tips of the Bray burners if it went long enough. They then commenced work on their mains, and he thought the water gas was taking up that deposit of naphthaline and carrying it into the house pipes. They found a very heavy condensation in their high pressure main, and also in the low pressure main, and they also found that in the heavy hours of the evening there was trouble in the governor, which showed that the condensation from the high pressure main was going into the low pressure main, and carried it along until it struck the fine orifice of the Welsbach burner where it was stripped by the heat and turned into this tarry substance. They put in a light pipe at that station and got several gallons of heavy, oily, deposit and were obliged to take it back to the works and burn it. To obviate that they put in a larger condenser and a large pulsation tank with condenser tubes in it and the trouble did not occur again. Although they used the light pipes they did not get the heavy deposit any more.

The President asked Mr. McIlhenny to close the discussion.

Mr. McIlhenny said he would answer only one point made by Mr. Earnshaw, who evidently misunderstood the speaker's idea of the relief holder. He mentioned only a slight reduction in temperature. The relief holder was of great advantage, both in water gas and coal gas condensation, and they used it in both cases. He thought there were other means of removing the tar without considering the possibilities of re-absorption, and not being subject to the variation of height and temperature in the relief holder. Where that was not possible the relief holder was of great benefit. Regarding the drying of gas in passing it through naphthaline, the naphthaline again being deposited, it was a question what was the condition of the gas with which the experiment was made. Were the constituents of that gas, which had the power of absorbing naphthaline, fully satisfactory, or was the naphthaline picked up mechanically, as the speaker supposed? If picked up mechanically it would only be carried along mechanically and would again be deposited by its own gravity. Mr. Norris had spoken of the range in temperature of pipes in Philadelphia. Evidently his figures were extreme ranges, as 23° was the lowest and 80° the highest, and even that was only a variation of 57°; but possibly that condition would only last a few hours, while the variation surrounding the gasholder and the gas before entering the distribution system would amount to 100° or 120°.

The President asked for the

REPORT OF THE COMMITTEE ON PRESIDENT'S ADDRESS,

which was read as follows:

MILWAUKEE, WIS., Oct. 19, 1905.

To the Members of the American Gas Light Association: Gentlemen—The committee to whom was referred the address of the President, begs leave to report the following:

The address is replete with valuable suggestions, but we feel that the following are entitled to special consideration.

We indorse a recommendation to appoint a committee to consider the advisability of enlisting the co-operation of other public service corporations, with a view of framing taxation laws national in their scope, and we recommend further that the committee shall consist of Messrs. Cowdery and McLean and such others as they may see fit to add.

The recommendation relative to collecting information regarding

municipal ownership is of great value, and we recommend it be referred to the standing committee of this Association on Municipal Ownership, and that the committee be authorized, if necessary, to solicit contributions from the members of this Association to defray the expenses of an investigation, as recommended by the President.

We indorse the idea of having a Secretary who can devote his entire time to the interest of the Association and who will be paid an adequate salary; but in view of the movement to amalgamate the various Associations, we do not feel that this is a proper time to take definite action towards that end. Respectfully submitted,

ALANSON P. LATHROP,
ROLLIN NORRIS,
WM. A. WOOD,
} Committee.

On motion of Mr. E. G. Pratt the report of the Committee was adopted, The President then called for the

REPORT OF THE RESEARCH COMMITTEE,

which was read by Mr. Rollin Norris as follows:

To the American Gas Light Association: Gentlemen—In 1898, at the annual meeting of this Association, the report of the Committee on Research recommended that the Association adopt as its standard the "Standard Gas Works Castings of the Society of Gas Lighting," and the report of the committee was voted on favorably, and in this way the existing standard was adopted, without any general knowledge on the part of the members of what that standard was, as the cuts and tables of dimensions formed an appendix to the report of the Committee on Research, and this appendix was, of course, not read at the meeting.

The fact that the Association had adopted a standard apparently made very little impression on most of the members, who continued to use castings from stock patterns whether standard or not. Some of the large users of specials tried to follow the new standard, but found it incomplete and in some respects inconsistent, and they had to fill in the gaps. Others went ahead and designed modified standards of their own.

At the meeting of the Association in 1900, President George G. Ramsdell in his address referred to the advisability of considering a revision of the standard, and the committee on the president's address recommended that the Secretary write to the pipe manufacturers and members, urging adherence to the standard. As a result of the Secretary's letter, a short topic, entitled "Comparison of Standards for Cast Iron Pipes and Specials," was read at the 29th annual meeting, by Mr. Walton Forstall, of Philadelphia. This paper discussed in detail the Association standard, compared it with the standard in use by the United Gas Improvement Company, and explained the reasons for some of the differences.

Although there was no formal motion to that effect, the sense of the meeting seemed to be that the Committee on Research should revise the standard and make it complete and acceptable to all members.

The matter, however, was not taken up for several years, but during the past year the attention of the Committee on Research was brought to the fact that one of the large manufacturers was working on this subject of the standardization of castings for gas works. It was felt that if the pipe manufacturers and representatives of some of the largest users of cast iron specials could be gotten together, a practicable and complete standard could be gotten up which could supplement, and when necessary modify, the present standard of the Association. A sub-committee was formed, and as the result of many conferences held by this committee, a set of drawings has been prepared, which the Committee on Research recommends for adoption as its standard.

The drawings and tables giving the details of the design of the various specials are appended to this report as "Appendix A," and this Appendix will be presented to the Association by Mr. Walton Forstall, who was the member of the sub-committee which prepared it.

This Appendix A has been sent out by the Secretary to the members of the Association, so that they can see in advance what is the new standard, and what changes it involves from the standard in 1898.

At the request of this committee, Mr. John B. Klumpp, of Philadelphia, has prepared a synopsis of the work done abroad in determining quantitatively the effect of atmospheric humidity on the light given by a 10-candle power Pentane standard. These results are charted and included in Appendix B to this report and this Appendix will be presented by Mr. Klumpp.

The proceedings of this meeting will contain a very interesting and suggestive paper by Mr. H. L. Rice, on the subject of "High Pressure Distribution of Gas." The rapid growth of this system of distributing gas lends a special importance to the question of what effect compression has upon the candle power of the gas, and this committee urges that some one undertake to prepare some definite and reliable figures covering this subject.

The report of this committee last year called attention to the importance in the preparation of programmes for Association work of endeavoring to follow the subjects to a conclusion, and we are glad to note that the investigation into the design and capacity of consumers' meters, which formed the subject of a paper at last year's meeting, is supplemented by an additional paper at this meeting.

Respectfully submitted, ROLLIN NORRIS,
Chairman, Committee on Research.

At the conclusion of the reading of the report Mr. Norris further said: There is not going to be time to have the report of the sub-committee, but I would like it understood, if the Association adopts this report, that it adopts the standard here given, which will be a modification of the old standard. I do not like "snap action," but as this may be the swan song of the American Gas Light Association, I think it is a wise thing to do.

On motion of Mr. R. M. Searle the report of the Research Committee and the recommendations therein were adopted by the Association.

APPENDIX A.

In giving the reasons for the proposed standards as shown in the accompanying cuts, it will be necessary to refer very often to the present standards of the Association, and for brevity it is proposed to refer to them as "A," and to the proposed standards as "C." All page numbers quoted in connection with "A" are those of Volume 15 of the "Proceedings."

Bell and Spigot Details.—In addition to not providing for certain important specials, as will be noted later on in the proper places, "A" extends only as high as 30 inches, not a sufficient range for the present needs of large companies. "C" extends to 48 inches.

The design of both bell and spigot in "A" (page 78) is faulty. The bell is too weak, and a fair idea of how "C" bells compare with "A" may be obtained by looking at the cuts on pages 290 to 302, inclusive, of Volume 18 of the Proceedings," for "C" bells differ but slightly from the dimensions there shown for the United Gas Improvement Company's bells. As shown on plate 1, "C" provides for a thickening of the pipe just back of the bell, this being in accordance with good foundry practice, because giving additional needed strength at this point.

The design and dimensions of lead ring of "A" are unchanged in "C." The depth of bell is the same, except in sizes 12 inches to 16 inches, where "C" is ½ inch deeper or 4½ inches; and 24 inches to 48 inches, where "C" is ¼ inch deeper or 5 inches. The increasing use of cement joints and the necessity of "cramping" joints give sufficient justification for these increases in depth.

The reason for the peculiar design of the bead in the "A" spigot is not obvious unless the great length of bead is to care for the impurities which sometimes collect in the spigot end. As good foundry practice insures that no impurities will be found in the end of the pipe, the above justification of the "A" bead is of no value, and there seems to be reason to think that the long annular space, formed between it and the bell, will probably never get properly packed with yarn. Also the concave face of the bead will interfere with the yarning iron. Therefore it seems obvious that the "C" spigot with its long bevel is to be preferred.

In the matter of lead room, "C" provides $\frac{5}{16}$ inch, for 16 inches and ⅜ inch for larger sizes, as compared with ½ inch in *A* for all sizes. Here again the change commends itself to those who have used large pipe and had experience with close joints.

Pipe Weights.—The weights shown on plate 1 are those thought to be most desirable for the average company. They differ little from *A* except in 10 inches, where "C" is 670 and *A* is 570, and in 20 inches with "C," 1,800 and "A," 1,900. As, however, in some of the large cities heavy traffic is the rule and shallow covering is often a necessary evil, in plate 2 is provided a series of weights about 10 per cent. heavier than plate 1. Also another form of lead groove is available if desired. Either this form or that shown in plate may be omitted altogether, where, as in using cement joints, no groove may be thought advisable. Of course, by varying the dimensions of the core, any specified weight may be obtained at no extra cost.

BENDS.

General.—The nomenclature of "A" (page 86) is very faulty and not in accord with general practice, the ordinarily named quarter (90°) bends being called "full" bends, the eighth (45°) "half" bends, and the sixteenth (22½°) "quarter" bends. There is no inherent advantage in such a system of naming worth the confusion that would result until most of us had managed to remember that a "quarter" bend was no longer one-quarter of a circle or 90°, but was a 22½° bend,

being a quarter of what was arbitrarily called a "full" bend. In discussing these bends the usual names will be used. "C" offers both all-bell and bell-and-spigot bends in a variety of sizes and designs. Experience has shown that with the great increase in underground conduit systems and consequent manholes, the bend is the one special most used in street work. With "A" a neat job would be impossible in many cases and spigot pieces of pipe would rapidly accumulate. In general the weights of "C" are less than those of "A."

Quarter.—In quarter of 90° bends, plate 3, both all-bell and bell-and-spigot bends are offered in sizes to 20 inches and bell and spigot to 24 inches. The all-bell bend has been made as compact as possible, thus saving weight. The spigot length also has been shortened from "A," but it is as long as experience shows is usually necessary. The result is quite a saving in weight in these "C" bends over "A." In plate 4, in sizes 24 inches and larger, a bell-and-spigot bend only is offered, as in these larger sizes an all-bell bend is not needed. These bends are made with a larger radius of curvature than the design in plate 3, and therefore offer less resistance, a feature of importance when conveying large volumes of gas. The design is such that they may be made with the same flask used for water bends of the same size. This, of course, is of great advantage to the manufacturer. As will be noted below, this same design is provided in eighth and sixteenth bends of large sizes.

Eighth.—In eighth or 45° bends, in addition to the choice of all-bell and bell-and-spigot bends offered by plate 6, an all-bell bend, plate, 5 is provided for, having one long arm. Experience has shown that in eighth (and sixteenth) bends, the short all-bell bend shown in plate 6 is not as convenient for laying around manholes and for ease in blocking as the form given in plate 5. What was said in discussing quarter bends, plate 3, applies also to eighth bends, plate 6. The range of these bends extends to 30 inches for bell-and-spigot and 20 inches for all bell, there being occasions where a short bell-and-spigot or an all-bell bend may be used to advantage in the large sizes. In plate 7, in sizes 20 inches and larger, is offered bell-and-spigot only, a bend of large radius for use where no obstacles prevent a gradual curve.

Sixteenth.—In sixteenth or 22½° bends, plates 8, 9, and 10, the same variety is offered as in eighth bends.

Bushings.

This very useful special (plate 11) is not provided in "A." "C" offers it in sizes found more useful. Of course, the series can be extended wherever advisable.

Caps.

"A" assumes that caps (plate 12) will never be needed. In practice this assumption is not justified, and "C" shows caps for all sizes. Where the size is large, lugs for lifting and ribs for stiffening are provided.

Crosses and Tees.

"C" provides (plate 13) for crosses and tees, both all-bell and bell-and-spigot, in all sizes deemed necessary. In "A" (pages 80 to 83) only all-bell branches are given. This lack of provision for spigot ends is a mistake, for not only in laying a new main, but especially in cutting into an old main, there are numerous occasions where a bell-and-spigot branch saves labor and material as compared with all-bell. Though concentric outlets are seldom if ever preferable to eccentric ones for street work, they are occasionally needed for connections to gas works apparatus, and therefore, though not shown in plate 13, they may be obtained if desired, weights and dimensions being practically as shown for the eccentric outlets. The laying lengths of "A" and "C" along the run are the same in most cases, except that in 30 inches (and larger) "C" decreases in laying length with the decrease in the size of the branch outlet, while "A" has the same laying length for a 30-inch × 4-inch tee or cross as for a 30-inch × 30-inch. Therefore, "C" weights are less for such reducing branches than "A." The length of the run in bell-and-spigot castings is from 8 to 10 inches longer than in the all-bell, and is considered a very suitable length.

Drip Pots.

General.—"A" (page 85) provides for only one design of drip pot and in size only to 16 inches, the idea being, I suppose, that for the larger sizes, the pot would not be in the line. "C" plates 14, 15 and 16, recognize line, holder and yard drips, in sizes up to 48 inches. The design of all these pots is stronger than "A." The opening at the top has been made the full diameter of the pot, because the disadvantages to the user of such a large opening, as compared with one of about a foot, as found in many drip pots, seemed too trivial to outweigh the great advantage to the foundry of a full sized opening.

Line.—Opinions as to drip pot dimensions and the relations of diameter to depth of pot for any size of main are apt to vary considerably. At times only a shallow drip is needed or convenient, but if all contingencies that might arise in regard to drips were to be covered, it would require a very large variety of shapes, and what might be gained in certain cases by having on hand just the right drip would be more than lost by the interest and depreciation on the large stock necessarily maintained. Plate 14 shows a series of drips, one for each size of pipe, designed (except 4 inches and 6 inches) with an internal diameter larger by one size of pipe than that of the main with which connected. This gives the drip about the same width in the line as the bells of the main. Space in the street for any greater width might not be obtainable and any less would not give sufficient capacity without great depth. The depth of all except the 4 inches is about 2 feet below the bottom of the main. The capacities obtained are quite large enough for all cases except some trunk main carrying the entire output of a manufacturing or holder station, and drips for such mains are most economically constructed by using lengths of pipe connected as a side drip.

Holder.—These drips, plate 15, are made of much larger capacity than those for street work. In works property there exist no obstacles preventing a drip pot from being of large diameter and thus getting great capacity without undue depth and consequent expensive excavation.

Yard.—These drips, plate 16, are similar in design to the holder drips, except having two bells instead of one.

Hat Flanges.

These specials, plate 17, are not provided for in "A," which presupposes tnat in making connections to mains, whether in new work or cutting into old mains, branches will always be used. This, of course, is not the case, and current good practice is along the lines of using hat flanges where one of the two mains is quite large and the other quite small, especially if the larger main is already in use and the smaller one is to be connected to it. In new work, say, laying a 30-inch main, it is more expensive in material and produces a line with more joints, to use branches for connections, than to lay straight lengths past all 6-inch, 8-inch and 12-inch connections and join in by hat flanges. The sizes provided for indicate what is considered to be the proper limitation of the use of hat flanges.

Plugs.

In "A," page 84, no provision is made for means of lifting heavy plugs. "C" has lugs for the larger sizes, as in the case of caps. The "C" weights are very much lighter than those of "A."

Reducers.

In "A," page 84, two lengths of reducers are given for each size, but there is no exchangeability of spigots and bells as between large and small ends, and each form is concentric, thus making it inconvenient to drain a larger main into a smaller without a trap. Also an eccentric reducer permits a certain variation in the position of the connections of mains which is of value at times in congested streets. "C," plates 19, 20 and 21, gives a full line of all-bell, small-spigot-large-bell, and small-bell-large-spigot reducers of lengths varying with the amount of reduction, giving an approximately constant angle. In plate 22 a line of small-bell-large-spigot concentric reducers are given to be used for holder drips in brick tanks.

Sleeves.

Split.—The design of split sleeves in "A," page 88, is faulty in providing for a uniform length of 1 foot for all sleeves over 6 inches in size. This makes too short a sleeve in the larger sizes. In "C," plate 23, a line of split sleeves, increasing in length with size, is provided. A lead groove is given all sleeves, and calking rings for the larger sizes.

Hub.—"A" made no provision for hub sleeves (plate 24), a special that is very useful for connecting mains where the difference in size is considerable, but the largest main is not greater than, say, 20 inches. Above that size a hat flange would be used, as has already been noted in speaking of that special. The hub sleeve, as may be seen from the plate, is the half of an ordinary split sleeve with a bell cast on it. Where two connections are desired at the same point, two of these hub halves are used.

Service.—"C" offers a service sleeve (plate 25), which is the ordinary split sleeve provided with a boss and tapped for various sizes of wrought iron pipe. These sleeves are for use wherever service connections are made to a 2-inch or 3-inch main without the use of a branch, or where in larger mains the size of the hole necessary for the service makes it advisable to strengthen the main at that point. The use of these sleeves

is described in some detail on pages II. and III. of the Appendix to Vol. 15 of the Proceedings.

Solid.—In "A," page 88, the length of solid sleeves being the same as that of split, is only 1 foot for a 30-inch main. As the depth of bell of this size main is 4¼ inches, it can be seen that in making a sleeve joint and allowing 5 inches for the depth of the joint and 1 inch for clearance, there would be left only 6 inches of the sleeve length to distribute over the two pipe ends, affording but a 3-inch depth of joint in each place. In the design of solid sleeves in "C," plate 26, this error has been avoided. Notwithstanding this increase in length, the weights of "C" are not as heavy proportionately as those of "A."

Y's.—This special, quite useful in cities where streets intersect at various angles, is not given in "A." "C," plate 27, provides for all full sizes, and a certain number of reducing sizes in both all-bell and bell-and-spigot.

Flanged Pipe and Specials.

In the design of the flanged pipe and specials, the "A" standard has been adhered to in all respects, except as follows: In sizes 12 inches and under, the thickness and outside diameter of flange have been changed to conform to the A. S. M. E. standard. In all sizes the distance from center to face has been shortened, no special being made longer than necessary for bolt requirements. This saving in length is of great importance in large work, economizing in building and land space. The thickness of the pipe has been changed but so little as to make no practical difference.

General Remarks.

The idea that has been kept in mind in preparing the proposed standard is to provide for all specials that would be used in sufficient quantities to warrant a large company keeping them in stock, and a foundry having them in stock ready to supply an order from a small company. Also for all specials that, though used but rarely, yet when needed, must be ordered, no substitute being advisable. On the other hand, it was thought that it would not be advisable or necessary to provide for certain specials used but rarely.

As no 2-inch pipe is now laid, and existing mileage of that size is being abandoned very rapidly, no 2-inch specials are offered except in split and service sleeves, the one being necessary to repair broken mains, the other to lay services from 2-inch mains. No 3-inch are given except bushings, reducers, caps, plugs and sleeves, solid, split and service. This is based on the assumption that no new 3-inch pipe is now laid, and that if any recovered 3-inch is relaid there will be sufficient bends, branches and drip pots recovered to use for relaying purposes. The 3-inch specials that are provided are the ones that are in constant demand by every company that has 3-inch pipe in use, and a sufficient supply through the recovery of old material is not to be depended on.

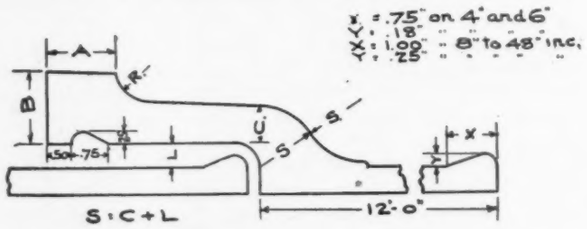
Following the same line of thought, no provision is made in crosses and tees for 3-inch outlets, as it is considered that in laying a new line of main and connecting to 3-inch mains, it is better practice to use a 4-inch or 6-inch outlet and reduce down than to use a 3-inch outlet, even though it is very uncertain whether the 3-inch main will ever be abandoned. As the sizes of the crosses and tees increase the 4-inch outlet is abandoned, because it is believed that, rather than keep a stock of both 4-inch and 6-inch outlets, it is better policy to keep 6-inch only and use a reducing fitting wherever the connection is to a 4-inch main.

For the same reason of not desiring to increase the number of specials to be carried in stock to a point where the interest and depreciation on the investment outweighs any advantage gained by the possession of a rarely-used special, no all-spigot specials of any kind are shown. Experience has proved that while an all-spigot bend or reducer is useful once in a while, the occasion arises too seldom to carry it for months or years until needed.

In adopting the proposed standard, no one need fear that pipe and specials made by it will not join up in proper fashion with existing main systems if the latter have been made from the ordinary patterns in use for the last 30 years. Neither should the small company which has been buying both flange and bell castings from a local foundry, fear lest, with the new standard, the same body pattern will not serve for both classes of work, and therefore the company be asked to pay for new patterns. For although the use of the same body pattern for both bell and flange work is not usually desirable practice, it will be possible to obtain the same laying length in flange work as given by "C," by substituting on a body pattern of the bell-and-spigot special a flange for a bell.

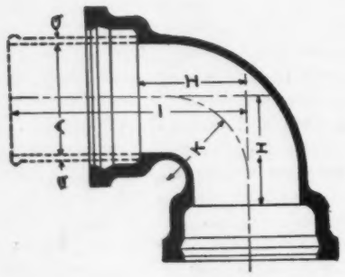
While, of course, it will be impossible to expect the foundry men to sacrifice at once all existing patterns that do not conform to the new standards, yet, in the event of its adoption every mem ber should strive to buy more and more as the years go on, only those specials made according to the standard, even though it may mean a little delay in securing the castings. In this way the complete adoption of the standard will be hastened. Also if it is known that specials made according to the standard are always preferred, the large foundries will construct metal fixtures for casting specials and equip for machine molding in the small sizes, all of which will tend to improve the quality of the work and cheapen the cost. Again, in kinds and sizes which are largely used, specials can be made by a foundry in a dull season and stacked up with the assurance that the design will be acceptable to all customers, and when an order comes in it can be filled without delay. This ability to manfacture in large lots and at convenient seasons wiil materially aid in lowering prices.

Standards Adopted by the American Gas Light Association.



STANDARD STRAIGHT PIPE.

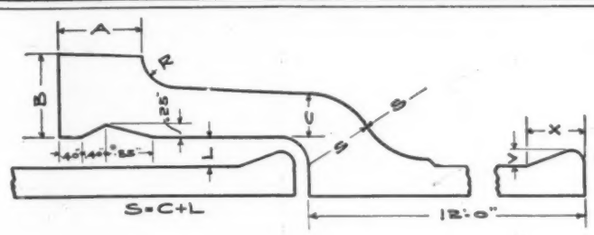
Nominal Dia.	Out side Dia	Thickness	Dia. of Sockets		Depth of Sockets		A	B	C	L	Weight per	
			Pipe	Special Castings	Pipe	Special Castings					Foot	Length
Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	Inches	lbs.	lbs.
4	4.80	.40	5.80	5.80	4.00	4.00	1.50	1.30	.65	.50	19.0	228
6	6.90	.43	7.90	7.90	"	"	"	1.40	.70	"	30.0	360
8	9.05	.46	10.05	10.05	"	"	"	1.50	.75	"	42.0	504
10	11.10	.48	12.10	12.10	"	"	"	"	"	"	55.8	670
12	13.20	.54	14.20	14.20	4.50	4.50	"	1.60	.80	"	72.5	870
16	17.20	.60	18.30	18.30	"	"	1.75	1.80	.90	.55	108.3	1300
20	21.34	.67	22.59	22.59	"	"	"	2.00	1.00	.625	150.0	1800
24	25.52	.76	26.77	26.77	5.00	5.00	2.00	2.10	1.05	"	204.2	2450
30	31.74	.88	32.99	32.99	"	"	"	2.30	1.15	"	291.7	3500
36	37.96	.99	39.21	39.21	"	"	"	2.50	1.25	"	391.7	4700
42	44.20	1.10	45.45	45.45	"	"	"	2.80	1.40	"	517.5	6150
48	50.50	1.26	51.75	51.75	"	"	"	3.00	1.50	"	666.7	8000



QUARTER BENDS

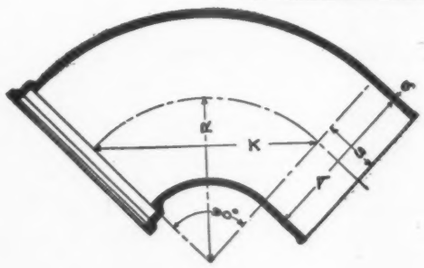
SIZE	A	G	H	I	K	WEIGHT-LBS. Double Bell	WEIGHT-LBS. Bell and Spigot
INCHES	INCHES	INCHES	INCHES	INCHES	INCHES		
4"	4.00	.40	4.50	13.00	3.00	45	45
6"	6.00	.43	6.25	16.50	4.50	81	78
8"	8.00	.46	8.00	15.00	6.00	122	116
10"	10.00	.48	9.75	19.50	7.50	174	165
12"	12.00	.54	11.25	21.00	9.00	235	227
16"	16.00	.60	14.50	24.00	12.00	336	346
20"	20.00	.67	17.75	27.00	15.00	606	522
24"	24.00	.76	21.00	30.00	18.00	*	874

* NOT TO BE MADE.



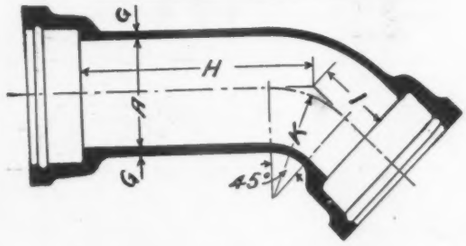
STANDARD-STRAIGHT-PIPE
EXTRA HEAVY

NOM-INAL DIA.	OUT-SIDE DIA.	THICK-NESS	DIA. OF SOCKETS		DEPTH OF SOCKETS		A	B.	C.	L.	PATT.	WEIGHT-PER	
			PIPE	SPECIAL CASTINGS	PIPE	SPECIAL CASTINGS					CLASS	FOOT	LENGTH
INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES	INCHES		LBS.	LBS.
4	5.00	.42	5.80	5.80	4.00	4.00	1.50	1.30	.65	.40	B	20.0	240
6	7.10	.47	7.90	7.90	"	"	1.50	1.40	.70	"	"	32.8	394
8	9.05	.49	9.85	9.85	"	"	1.50	1.50	.75	"	A	45.3	543
10	11.10	.51	11.90	11.90	"	"	1.50	1.50	.75	"	"	58.7	703
12	13.20	.57	14.00	14.00	4.50	4.50	1.50	1.60	.80	"	"	76.1	913
16	17.40	.65	18.50	18.50	"	"	1.75	1.80	.90	.50	"	117.2	1406
20	21.60	.75	22.60	22.60	"	"	1.75	2.00	1.00	"	"	166.7	2000
24	25.80	.82	26.80	26.80	5.00	5.00	2.00	2.10	1.05	"	"	224.0	2688
30	32.00	1.00	33.00	33.00	"	"	2.00	2.30	1.15	"	B	323.5	3882
36	38.30	1.05	39.30	39.30	"	"	2.00	2.80	1.40	"	"	442.7	5312
42	44.50	1.26	45.50	45.50	"	"	2.00	3.00	1.50	"	"	581.3	6975
48	50.80	1.38	51.80	51.80	"	"	2.00	3.30	1.65	"	"	739.6	8775



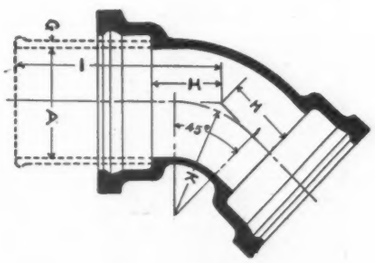
QUARTER BENDS.

A	G	K	R	S	WGTS.
INCHES	INCHES	INCHES	INCHES	INCHES	LBS.
24	.76	42.40	30	12	1100
30	.88	50.90	36	12	1814
36	.99	67.90	48	12	2964
42	1.10	84.80	60	12	4536
48	1.26	93.32	66	12	5916



EIGHTH BENDS

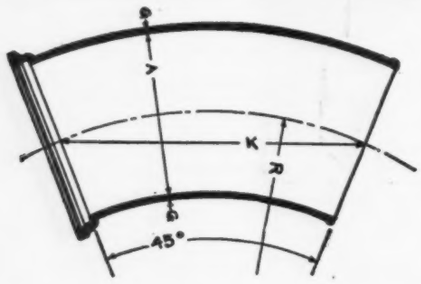
A	G	H	I	K	WGT.
INCHES	INCHES	INCHES	INCHES	INCHES	LBS.
4	.40	13.65	3.15	4.0	65
6	.43	14.48	4.23	6.0	101
8	.46	15.31	5.31	8.0	152
10	.49	16.14	6.39	10.0	212
12	.54	16.97	7.22	12.0	274



EIGHTH BENDS.

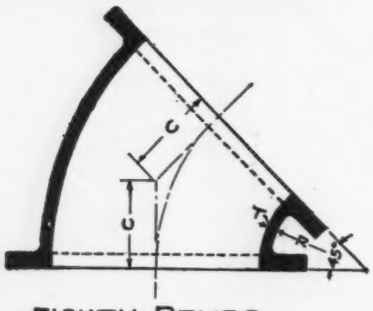
A	G	H	I	K	WEIGHTS-LBS.	
					DOUBLE BELL	BELL AND SPIGOT
INCHES	INCHES	INCHES	INCHES	INCHES		
4	.40	3.16	2.050	4	50	55
6	.43	4.23	21.50	6	77	88
8	.46	5.31	22.25	8	120	132
10	.49	6.39	23.00	10	170	184
12	.54	7.22	24.00	12	220	243
16	.60	9.12	25.00	6	372	396
20	.67	11.03	27.25	20	548	576
24	.76	12.94	29.00	24	*	838
30	.88	15.67	31.50	30	*	1335

* NOT TO BE MADE.



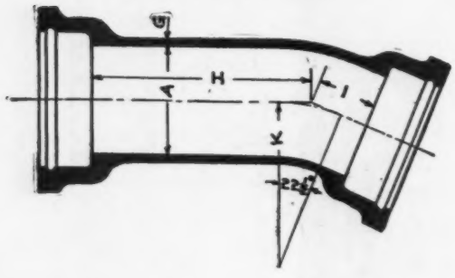
EIGHTH BENDS

A INCHES	G INCHES	K INCHES	R INCHES	WGTS. LBS.
20	.67	36.70	48	589
24	.76	45.90	60	937
30	.88	45.90	60	1342
36	.99	68.90	90	2492
42	1.10	68.90	90	3277
48	1.26	68.90	90	4244



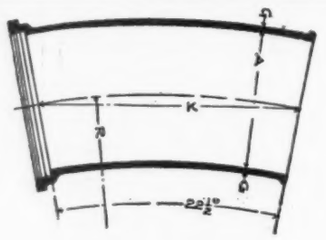
EIGHTH BENDS

NOMINAL DIA.	C	T	R	WGT. IN LBS.
4	3.42	.40	2.0	27
6	4.23	.43	3.0	42
8	5.63	.46	"	66
10	5.44	.49	4.0	85
12	5.82	.54	"	133
16	6.62	.60	"	191
20	8.82	.67	5.0	308
24	9.59	.76	"	447
30	11.76	.88	"	732
36	14.65	.99	5.5	1119
42	15.83	1.10	"	1510
48	16.97	1.26	"	2142



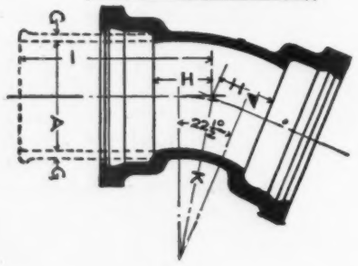
SIXTEENTH BENDS

A INCHES	G INCHES	H INCHES	I INCHES	K INCHES	WGT. LBS.
4	.40	14.70	2.69	6.0	66
6	.43	15.53	3.53	9.0	98
8	.46	16.38	4.38	12.0	147
10	.49	17.25	5.22	15.0	213
12	.54	17.81	5.81	18.0	273



SIXTEENTH BENDS.

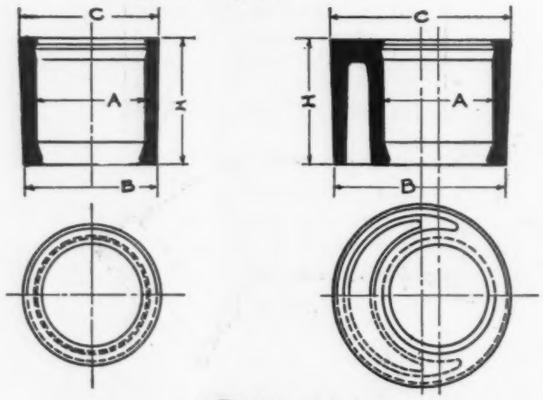
A INCHES	G INCHES	K INCHES	R INCHES	WGTS. LBS.
20	.67	37.50	96	589
24	.76	46.80	120	937
30	.88	46.80	120	1342
36	.99	70.20	180	2497
42	1.10	70.20	180	3277
48	1.26	70.20	180	4244



SIXTEENTH BENDS

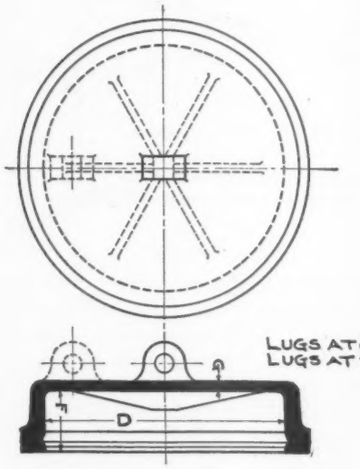
A INCHES	G INCHES	H INCHES	I INCHES	K INCHES	WGTS.—LBS. DOUBLE BELL	WGTS.—LBS. BELL & SPIGOT
4	.40	2.67	20.25	6	49.	54
6	.43	3.50	20.76	9	75.	85
8	.46	4.34	21.25	12	115.	127
10	.49	5.17	22.00	15	161.	175
12	.54	5.76	22.50	18	207.	229
16	.60	7.18	23.75	24	356.	368
20	.67	8.60	24.75	30	514.	541
24	.76	10.02	26.00	36	*	764.
30	.88	12.02	27.75	45	*	1196

* NOT TO BE MADE.



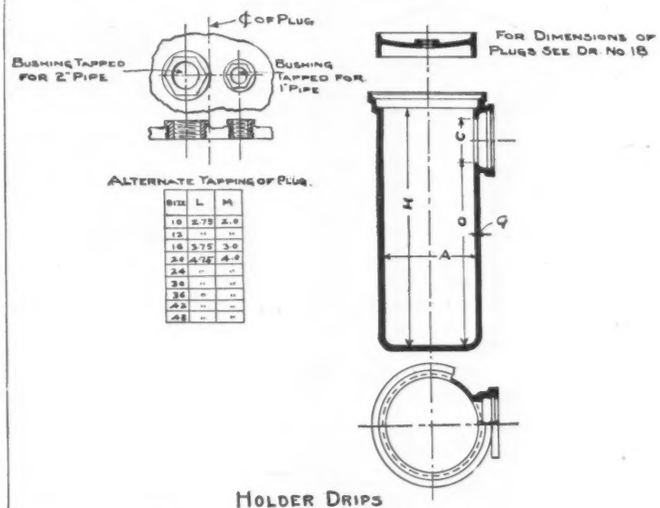
BUSHINGS

SIZE	6x3 INCHES	6x4 INCHES	8x4 INCHES	8x6 INCHES	10x6 INCHES	10x8 INCHES	12x6 INCHES	12x8 INCHES	12x10 INCHES
A	4.60	5.80	5.80	7.90	7.90	10.05	7.90	10.05	12.10
B	6.65	6.65	8.80	8.80	10.85	10.85	12.95	12.95	12.95
C	6.90	6.90	9.05	9.05	11.10	11.10	13.20	13.20	13.20
H	4.50	4.50	4.50	4.50	4.50	4.50	5.00	5.00	5.00
WGTS. LBS.	22	15	26	18	43	24	62	63	33



CAPS

SIZE INCHES	D INCHES	F INCHES	G INCHES	WGT LBS.
3	4.80	4.00	.40	18
4	5.80	4.00	.40	22
6	7.90	4.00	.43	32
8	10.05	4.00	.46	50
10	12.10	4.00	.49	68
12	14.20	4.50	.54	86
16	18.30	4.50	.60	144
20	22.59	4.50	.67	209
24	26.77	5.00	.76	282
30	32.99	5.00	.88	446
36	39.21	5.00	.99	613
42	45.45	5.00	1.10	851
48	51.75	5.00	1.26	1060

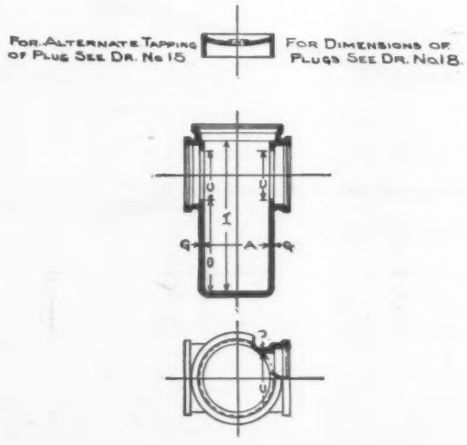


SIZE	L	M
10	2.75	2.0
12	"	"
16	3.75	3.0
20	4.75	4.0
24	"	"
30	"	"
36	"	"
42	"	"
48	"	"

HOLDER DRIPS

SIZE	A	C	G	H	J	O	CAP. IN QTS.	WEIGHT IN LBS. *
4	14	4	.57	54	.40	490	129	492
6	14	6	.57	"	.43	470	124	499
8	18	8	.64	"	.46	450	204	720
10	18	10	.64	"	.49	430	185	732
12	24	12	.76	60	.54	4681	358	1240
16	30	16	.88	72	.60	5475	658	1782
20	30	20	.88	"	.67	5056	609	2037
24	30	24	.88	"	.76	4638	562	2030
30	36	30	.99	84	.88	5138	904	3063
36	42	36	1.10	"	.99	4538	1087	3958
42	48	42	1.26	90	1.10	4538	1404	5398
48	54	48	1.35	90	1.26	3925	1550	7050

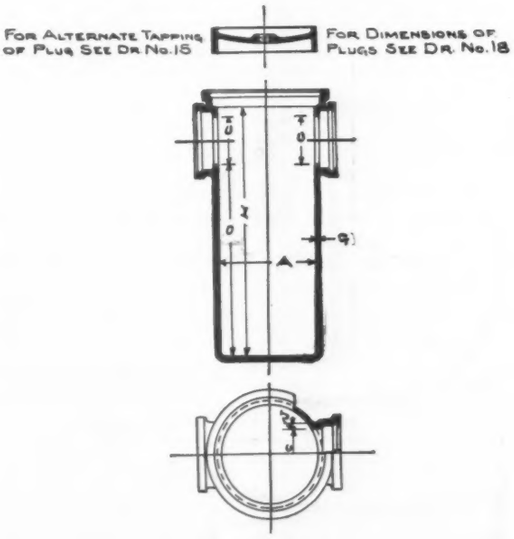
* DOES NOT INCLUDE WEIGHT OF PLUG.



LINE DRIPS

O	SIZE INCHES	A INCHES	C INCHES	G INCHES	H INCHES	J INCHES	WGTS * LBS	CAPACITY IN QTS.
13.0	4	12.00	4.00	.54	18	.40	209	24
21.0	6	12.00	6.00	.54	28	.43	267	40
25.0	8	12.00	8.00	.54	32	.46	318	44
25.0	10	16.00	10.00	.60	36	.49	498	83
26.81	12	16.00	12.00	.60	40	.54	544	92
26.75	16	20.00	16.00	.67	44	.60	828	140
26.56	20	24.00	20.00	.76	48	.67	1197	204
26.38	24	30.00	24.00	.88	52	.76	1813	320
25.38	30	36.00	30.00	.99	58	.88	2673	450
"	36	42.00	36.00	1.10	64	.99	3595	605
"	42	48.00	42.00	1.26	70	1.10	5420	785
25.25	48	54.00	48.00	1.35	76	1.26	6486	980

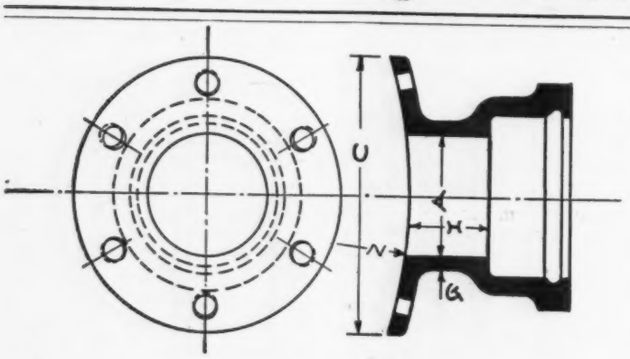
* DOES NOT INCLUDE WEIGHT OF PLUG.



YARD DRIPS

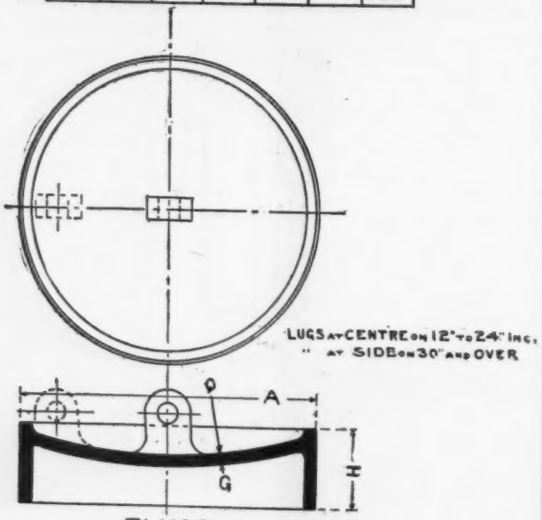
SIZE	A	C	G	H	J	O	CAPACITY IN QTS	WEIGHT IN LBS *
4	14	4	.57	54	.40	490	129	516
6	14	6	.57	"	.43	470	124	526
8	18	8	.64	"	.46	450	204	759
10	18	10	.64	"	.49	430	185	771
12	24	12	.76	60	.54	4681	358	1307
16	30	16	.88	72	.60	5475	658	1881
20	30	20	.88	"	.67	5056	609	2174
24	30	24	.88	"	.76	4638	562	2212
30	36	30	.99	84	.88	5138	904	3324
36	42	36	1.10	"	.99	4538	1087	4297
42	48	42	1.26	90	1.10	4538	1404	5863
48	54	48	1.35	90	1.26	3925	1550	7350

* DOES NOT INCLUDE WEIGHT OF PLUG.



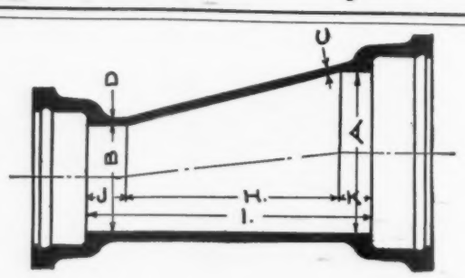
HAT FLANGE

SIZE	A	C	G	H	N	WGT.
24×6	6	13.50	.43	4	13.0	6
24×8	8	15.50	.46	"	"	87
24×10	10	17.50	.49	"	"	105
24×12	12	19.50	.54	"	"	130
30×6	6	13.50	.43	"	16.0	66
30×8	8	15.50	.46	"	"	87
30×10	10	17.50	.49	"	"	105
30×12	12	19.50	.54	"	"	130
36×6	6	13.50	.43	"	19.25	66
36×8	8	15.50	.46	"	"	87
36×10	10	17.50	.49	"	"	105
36×12	12	19.50	.54	"	"	130
42×6	6	13.50	.43	"	22.37	66
42×8	8	15.50	.46	"	"	87
42×10	10	17.50	.49	"	"	105
42×12	12	19.50	.54	"	"	130
48×6	6	13.50	.43	"	25.50	66
48×8	8	15.50	.46	"	"	87
48×10	10	17.50	.49	"	"	105
48×12	12	19.50	.54	"	"	130



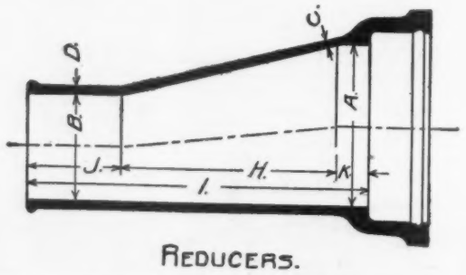
PLUGS.

SIZE INCHES	A INCHES	G INCHES	H INCHES	Q INCHES	WGTS LBS
3	3.80	.40	5.25	4.0	8
4	4.80	.40	5.25	4.0	9
6	6.90	.43	5.25	6.0	16
8	9.05	.46	5.25	8.0	25
10	11.10	.49	5.25	10.0	34
12	13.20	.54	6.00	12.0	48
16	17.20	.60	6.00	22.0	82
20	21.34	.67	6.00	36.0	125
24	25.52	.76	6.50	60.0	185
30	31.74	.88	6.50	78.0	308
36	37.96	.99	6.50	90.0	461
42	44.2	1.10	6.50	120.0	658
48	50.5	1.26	6.50	150.0	730



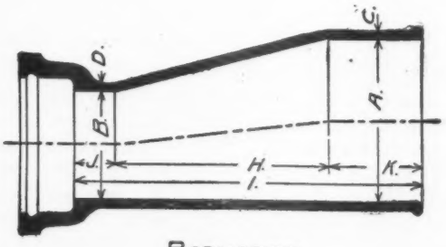
REDUCERS.

A Inches	B Inches	C Inches	D Inches	H Inches	J Inches	K Inches	I Inches	Weight lbs.
4	3	.40	.40	7.0	2.5	2.5	12.0	55
6	3	.43	"	12.0	"	"	17.0	62
	4	"	"	7.0	"	"	12.0	65
8	4	.46	"	15.0	"	"	20.0	108
	6	"	.43	7.0	"	"	12.0	109
10	4	.49	.40	23.0	"	"	28.0	166
	6	"	.43	15.0	"	"	20.0	151
	8	"	.46	7.0	"	"	12.0	145
12	6	.54	.43	23.0	3	"	28.5	213
	8	"	.46	15.0	"	"	20.5	206
	10	"	.49	7.0	"	"	12.5	189
16	8	.60	.46	32.0	"	"	37.5	367
	10	"	.49	24.0	"	"	29.5	359
	12	"	.54	15.0	2.5	"	20.0	326
20	10	.67	.49	40.0	3.0	"	45.5	586
	12	"	.54	32.0	2.5	"	37.0	534
	16	"	.60	16.0	"	"	21.0	475
24	16	.76	"	30.5	3.5	3.0	37.0	755
	20	"	.67	14.5	"	"	21.0	643
30	20	.88	"	39.0	"	"	45.5	1017
	24	"	.76	24.0	3.0	"	30.0	1064
36	24	.99	"	48.0	"	"	54.0	1809
	30	"	.88	24.0	"	"	30.0	1459
42	30	1.10	"	48.0	"	"	54.0	2476
	36	"	.99	24.0	"	"	30.0	1937
48	36	1.26	"	48.0	"	"	54.0	3219
	42	"	1.10	24.0	"	"	30.0	2540



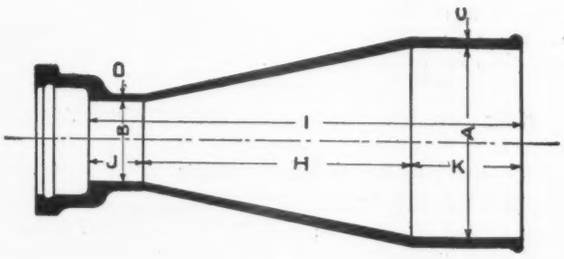
REDUCERS.

A. Inches	B. Inches	C. Inches	D. Inches	H. Inches	J. Inches	K. Inches	I. Inches	Weight lbs
4	3	.40	.40	7.0	6.5	2.5	16.0	40
6	3	.43	"	12.0	"	"	21.0	58
	4	"	"	7.0	"	"	16.0	51
8	4	.46	"	15.0	"	"	24.0	93
	6	"	.43	7.0	"	"	16.0	88
10	4	.49	.40	23.0	"	"	32.0	152
	6	"	.43	15.0	"	"	24.0	132
	8	"	.46	7.0	"	"	16.0	111
12	6	.54	.43	23.0	7.0	"	32.5	194
	8	"	.46	15.0	"	"	24.5	175
	10	"	.49	7.0	"	"	16.5	159
16	8	.60	.46	32.0	"	"	41.5	336
	10	"	.49	24.0	"	"	33.5	318
	12	"	.54	15.0	"	"	24.5	277
20	10	.67	.49	40.0	"	"	49.5	565
	12	"	.54	32.0	"	"	41.5	485
	16	"	.60	16.0	"	"	25.5	394
24	16	.76	"	30.5	8.0	3.0	41.5	641
	20	"	.67	14.5	"	"	25.5	485
30	20	.88	"	39.0	"	"	50.0	859
	24	"	.76	24.0	"	"	35.0	862
36	24	.99	"	48.0	"	"	59.0	1607
	30	"	.88	24.0	"	"	35.0	1163
42	30	1.10	"	48.0	"	"	59.0	2180
	36	"	.99	24.0	"	"	35.0	1564
48	36	1.26	"	48.0	"	"	59.0	2836
	42	"	1.10	24.0	"	"	35.0	2003



REDUCERS

	A. Inches	B. Inches	C. Inches	D. Inches	H. Inches	J. Inches	K. Inches	I. Inches	Weight lbs
	4	3	.40	.40	7.0	2.5	6.5	16.0	40
	6	3	.43	"	12.0	"	"	21.0	54
		4	"	"	7.0	"	"	16.0	48
	8	4	.46	"	15.0	"	"	24.0	86
		6	"	.43	7.0	"	"	16.0	76
	10	4	.49	.40	23.0	"	"	32.0	125
		6	"	.43	15.0	"	"	24.0	111
		8	"	.46	7.0	"	"	16.0	101
	12	6	.54	.43	23.0	3.0	7.0	33.0	165
		8	"	.46	15.0	"	"	25.0	157
		10	"	.49	7.0	"	"	17.0	151
	16	8	.60	.46	32.0	"	"	42.0	286
		10	"	.49	24.0	"	"	34.0	278
		12	"	.54	15.0	2.5	"	24.5	245
	20	10	.67	.49	40.0	3.0	"	50.0	494
		12	"	.54	32.0	2.5	"	41.5	422
		16	"	.60	16.0	"	"	25.5	363
	24	16	.76	"	30.5	3.5	8.0	42.0	569
		20	"	.67	14.5	"	"	26.0	507
	30	20	.88	"	39.0	"	"	50.5	1021
		24	"	.76	24.0	3.0	"	35.0	866
	36	24	.99	"	48.0	"	"	59.0	1577
		30	"	.88	24.0	"	"	35.0	1205
	42	30	1.10	"	48.0	"	"	59.0	2200
		36	"	.99	24.0	"	"	35.0	1653
	48	36	1.26	"	48.0	"	"	59.0	2859
		42	"	1.10	24.0	"	"	35.0	2109



REDUCERS

A INCHES	B INCHES	C INCHES	D INCHES	H INCHES	J INCHES	K INCHES	I INCHES	WGT. IN LBS.
14	4	.57	.40	20.0	4.0	8-0	32.0	164
"	6	"	.46	"	"	"	"	185
18	8	.64	.46	"	"	"	"	266
"	10	"	.49	"	"	"	"	296
24	12	.76	.54	26.0	3.5	"	37.5	480
30	16	.88	.60	"	"	"	"	716
"	20	"	.67	"	"	"	"	812
"	24	"	.76	"	3.0"	"	37.0	917
36	30	.99	.88	32	"	"	43.0	1437
42	36	1.10	.99	"	"	"	"	1882
48	42	1.26	1.10	"	"	"	"	2490
54	48	1.35	1.26	"	"	"	"	3210

THESE REDUCERS ARE USED IN CONNECTION WITH HOLDER DRIPS IN BRICK TANKS

(To be Concluded.)

An Original Method of Estimating Naphthaline in Coal Gas.[1]

At the meeting of the London Section of the Society of Chemical Industry, at Burlington House, the first week in December, Mr. C. J. Dickenson Gair, of the Vauxhall Works of the South Metropolitan Gas Company, read a paper on the above subject.

The author commenced by remarking that at first sight, the estimation of naphthaline, either in pure or impure coal gas, did not appear to be beset with any great difficulty. The well-known fact that the vapor of naphthaline precipitated naphthaline picrate when passed through a strong solution of picric acid was, he proceeded to remark, apparently all that was necessary on which to base a method of estimation. But it was found impossible to estimate naphthaline in coal gas by merely passing a measured quantity of the gas through a picric acid solution, and then weighing the precipitate so formed as naphthaline picrate, because, in the first place, all the naphthaline would not combine with the picric acid, but some of it condensed out in the free state. In the second place, a quantity of naphthaline invariably condensed in the delivery pipe and connections of the apparatus, and, furthermore, with coal gas containing quantities of ammonia, the picric acid was neutralized to some extent—ammonium picrate being formed, which, of course, quite destroyed any degree of accuracy. Thus it would be seen that a naphthaline estimate must always be accompanied with precautions which made it by no means a simple matter.

Continuing, he referred to the method of estimation devised by Dr. Colman and Mr. Smith, and gave a short sketch of a slight modification of the original, which had been found very simple and rapid of execution. The gas to be tested was passed through three Woulff's bottles, containing exactly 500 c.c. of $\frac{N}{20}$ picric acid solution, and then through an experimental gas meter. After a convenient number of cubic feet of gas had passed, the test was shut off, and the contents of the Woulff's bottles were mixed together in a 20-ounce flask, and carefully heated on a water bath to a temperature of about 60° C., until the precipitate of naphthaline and naphthaline picrate had entirely dissolved. Naphthaline picrate was easily decomposed by excessive heat; and to guard against loss from this cause, the flask was always fitted with a cork through which a glass tube dipped into a beaker containing a small quantity of picric acid from the Woulff's bottles. After the experiment the picric acid in the beaker was poured back into the flask, the contents of which were then cooled. Crystalline masses of naphthaline picrate separated out; and when quite cold the precipitate was filtered off, dried in vacuo, and weighed. From the weight of picrate thus found, the amount of naphthaline per 100 cubic feet of gas could be easily calculated.

The author next explained the volumetric method of estimation in vogue. An aliquot part of the clear residual picric acid solution was taken, Lacmoid indicator added, and the whole titrated with $\frac{N}{10}$ sodium hydrate solution. The difference between the result thus found and quantity of picric acid in the original solution represented the amount of picric acid which had combined with the naphthaline; and as 229 parts of the former combined with 128 parts of the latter, the amount of naphthaline in the gas was easily calculated. To guard against loss of naphthaline by condensation in the pipe leading to the apparatus, it was well, he said, to have a connection as near the main as possible, and surround it by a steam jacket. The author said he had found this an immense advantage in all methods of estimation.

Mentioning that the test devised by Mr. Colman and Mr. Smith was for pure or nearly pure coal gas, the author said it could be made to give gravimetric results with impure coal gas if the ammonia were removed. This was effected by means of oxalic acid solution, maintained at a temperature of about 80° C. All that was necessary was to introduce a Woulff's bottle containing the hot liquid in front of the bottles that contained the picric acid solution.

The next method noticed was one devised by Mr. Somerville, of the Bankside works of the South Metropolitan Gas Company. It differed entirely in principle, said the author, from that of Dr. Colman and Mr. Smith. Three glass tubes, about 7 inches long and 1 inch wide, were fitted up in a similar manner to Woulff's bottles, and about 35 c.c. of 70 per cent. alcohol were poured into each. The three bottles were closely connected. A measured quantity of gas was passed through; and the test was disconnected. The contents of the tubes were then intimately mixed in a flask. If the gas used was impure, it would be

1. *Journal of Gas Lighting.*

necessary to add strong oxalic acid solution until the ammonia was neutralized, as shown by litmus paper. The contents of the flask were filtered, and the filter paper washed with dilute alcohol. Concentrated picric acid was added in large excess (about 500 c.c. being generally necessary). The liquid was agitated and allowed to stand for about half an hour. By this time, all the naphthaline picrate would have separated out, and might be filtered, dried *in vacuo*, and weighed. This method has been found to be a very quick one, both for pure and impure gases. The advantage of the method was that the naphthaline picrate was easily obtained without the risk of loss of weight. The liquid filtered somewhat slowly, however, and owing to the finely divided state of part of the precipitate, it was often necessary to pour back the first part of the filtrate several times till it became quite clear.

The author next gave particulars of a separate and distinct method for the gravimetric estimation of naphthaline which he had himself devised. It was founded on the action of a suitable solvent. Remarking that the solvents for naphthaline which were applicable for its estimation were few and far between, he said that in this case use was made of acetic acid of a specific gravity of 1.044. About 350 c.c. were taken in Woulff's bottles or towers, and a measured volume of gas (not more than from 3 to 6 cubic feet usually) was passed through, at the rate of about 1 cubic foot per hour. If the gas was impure, use was made of the hot oxalic acid solution previously mentioned, as a catch. A small Woulff's bottle containing picric acid solution was also added. In the event of there not being sufficient pressure to force the gas through the wash bottles, or if the gas were under vacuum itself, use was made of a piece of apparatus which pulled the gas through the bottles by means of a water pump, after which the gas was automatically separated from the water and passed through the experimental meter at ordinary atmospheric pressure. After the experiment was finished, the acetic acid from the bottles was mixed in a flask, and about 500 c.c. of concentrated picric solution, in all, was added. Pure naphthaline picrate separated out at once, in large flocculent masses, which had the advantage of being extremely easy to filter. After filtering, the naphthaline picrate was dried *in vacuo* in a warm room and weighed. The method was proved to be correct by these means: A small corked bottle or U-tube was taken, having inlet and outlet tubes. A quantity of pure dry naphthaline crystals was inserted in the bottle and the whole weighed. The bottle was then connected up to a supply of coal gas from which every trace of naphthaline had been removed. The Woulff's bottles containing acetic acid and the one containing picric acid were connected, the experiment started and allowed to proceed for some time. The gas was then shut off, the bottle stoppered and placed in a desiccator for a few minutes and again weighed —the difference in the two weighings being the quantity of naphthaline passed into the bottles. The same process of precipitation, etc., was gone through as previously described; care being taken that any naphthaline crystals that might have been condensed in the colder parts of the apparatus were first dissolved in a small quantity of alcohol and then added to the acetic acid. The amount of naphthaline found by calculation was then compared with the quantity found by actual weighing.

The results of the experiments were as follows: Amount of naphthaline found by weighing, 0.500 grain; by experiment, 0.470 grain. Another experiment came out at 0.800 grain by weighing; 0.778 grain by experiment. Using air as the naphthaline conveying agent, the weight of naphthaline passed was 0.500 grain; and weight found by experiment, 0.491 grain. Another experiment came out at 0.550 grain and 0.537 grain respectively. In a further case the results were 0.400 grain and 0.394 grain respectively—the average error being 1.5 per cent. This showed that the method was sufficiently accurate for all technical purposes.

Several experiments, the author added, were made with coal gas against Dr. Colman and Mr. Smith's method; and he gave a few examples. By the acetic acid method with pure gas, one gave 39.4 grains of naphthaline per 100 cubic feet; and by the picric acid method, 38.4 grains. In another case, the respective figures were 31.3 and 32 grains. With impure gas, the figures came out very nearly as good. One experiment gave 33.1 grains with the acetic acid method, and 36.7 grains with the picric acid method. A second one gave in the 2 cases 35.8 grains. It was mentioned that in no experiment was any length of rubber tubing left exposed to the gas, because of its power to absorb large quantities of naphthaline.

In concluding, the author remarked that the reason for adding such large excesses of picric acid in the alcohol and acetic acid tests was because naphthaline picrate itself was quite soluble in both alcohol and acetic acid.

Wrinkles for the Plumber.

By D. F. N., in the *Metal Worker*.

Making examinations of dark wells: In order to view the interior of a deep well or tubes sunk in the ground, such as stop cock boxes and similar dark places, the plumber will often find it easy to take an ordinary mirror, holding it in such a position in the sunlight that the rays are directed into the opening. Enough light can be thrown into the dark hole to make a careful inspection of it. In places where it is unhandy to use a mirror, as in the inside of some buildings, the same result can often be secured by winding a piece of wire around a candle and lowering the lighted candle into the opening.

Stoppping a leak in a wrought iron fitting can either be done by calking the metal with a round nose calking iron, or if the break is relatively large a small piece of soft solder can be driven in and this will admirably serve the purpose of closing the opening. This method is also applicable to leaks in wrought iron storage tanks.

Repairing holes in enameled iron cooking utensils may be easily done by using ordinary soft iron tinned rivets or a copper rivet and washer. It is better, however, to ream out the hole the full size of the rivet and set the rivet up tight without hammering, as by placing it in a vise and screwing up the jaws. This will then mend the utensil and not crack the enamel around the hole.

Starting a charcoal fire in a private dwelling is often annoying to the occupants. A method that works very satisfactorily is to cut off about an inch of a candle, setting it in the center of a grate and carefully building up small pieces of charcoal around it. In this manner the fire pot can be filled and in about 5 minutes after the candle is lighted the fire will be nicely kindled and ready for heating a pot of solder or the soldering iron. This does away with the annoyance of filling the room with sparks when wood chips are used for kindling.

Catching a lost or broken sewer wire or snake wire if often done by following the wire originally inserted into the drain with a second wire, twisting this in much the same manner as a corkscrew. After several turns have been made it will be found that both wires have become connected together. They can then be easily withdrawn by hand, or if held very firm a block and fall can be used.

Making perfectly straight edges to seams in the lining of copper tanks is often a difficulty. Where particular work is desired it can be easily achieved by pasting along the edge of the seam a strip of paper muslin, which will prevent solder from flowing beyond the line desired. Boiled flour paste should be used for fastening the paper muslin. When the seams are finished the muslin can be dampened with a wet cloth and easily withdrawn.

Notes on the Standardization of Fuses.[1]

By Mr. Alfred Schwartz.

The fuse in this country is considered by most engineers to be a tricky and unreliable piece of apparatus; it is often spoken of as if it were on the point of being superseded by the circuit breaker—presumably in all sizes—and in general it is regarded by the up-to-date man as a legacy from the dark ages (*i. e.*, the transition period between the gas age and the era of electricity), and further, he considers that while it has to be tolerated as a necessary nuisance, it is entirely unworthy of the care and attention that he lavishes upon other portions of his electrical equipment.

Whenever a fire takes place on premises in which the electric light has been installed, it is in the first instance invariably attributed by the lay press to "the fusion of the electric wires." In most cases, however, it is ultimately traced to the gas or heating arrangements, but it is none the less our business to insure the safety of the electric system by a well considered system of fuses, so arranged that their abuse shall be made as difficult as possible, and that their overload capacity shall be of a predetermined value.

Before considering in detail the various points in connection with fuses in which standardization appears to be desirable, we must clearly recognize that no amount of standardization will prevent willful and determined tampering with a fuse. Careful standardization will, however, reduce this danger to a minimum, by the selection of a form of terminal which will render its misuse as troublesome as possible; while at the same time the ability to obtain from any dealer's stock the standard fuse required would render the legitimate replacement of the fuse far easier than it is at present.

1. *Electrical Review*, London.

Let us now briefly consider *seriatim* the particulars in connection with which standardization could be advantageous:

Length of Break.—The first risk in connection with fuses should be greatly reduced, first, by standardizing the length of break not only for various circuit voltages, but also for various carrying capacities.

The sudden breaking of a heavy short circuit current by a fuse produces an inductive pressure rise which may be very many times that of the line voltage. This is brought about by the collapse on breaking of the magnetic field due to the short circuit current; this current, if limited only by the resistance and self-induction of the circuit, would reach a very high value—possibly from 5,000 to 10,000 amperes on an ordinary service fused for 50 amperes. If the circuit is properly fused, however, it will be opened before the current has had time to mount to the value named above, and the short circuit current would in the case named be limited to about 1,000 amperes. The greater the capacity of the fuse the longer it will take to melt on short circuit, and in consequence the pressure rise will reach a proportionately greater value. A standard increase in the length of break with increased carrying capacity should, therefore, greatly reduce the chances of the persistence of the arc and consequently the fire risk.

Short Circuit Service.—The term short circuit is a relative one, and the effects which one may get on a consumer's premises connected to a large network are very much less severe than those obtainable on the station busbars. Some discrimination should, therefore, be used in standardizing, in order to avoid throwing on the general consumer the burden of the greater cost necessary for a fuse to withstand station conditions. Possibly two classes might be formed, one for fuses (usually of large carrying capacity) to withstand the severe conditions of a true short circuit, the other for fuses (usually of small carrying capacity) for use on circuits of a non-inductive character and of moderate resistance, such as one usually finds in connection with house installation work. As an alternative, some mean condition between these two might be specified in connection with the tests on short circuit with which the fuses would have to comply.

Material of Fuse.—It would appear desirable to specify the material, shape and arrangement of the fuse metal to meet the requirements of circuits which are capable of bearing different amounts of overload. For instance, an ordinary lighting circuit can usually safely withstand an overload of 100 per cent., and it is not desirable on such a circuit that the fuse should come into operation with a less excess current than that named; fuses arranged and rated to meet these conditions might be termed "insensitive" fuses. Arrangements might, however, be made for a further class or classes which would operate with excess currents of from 10 to 50 per cent., and which might be termed "sensitive fuses." Generally speaking, fuses of large carrying capacity would be placed in the latter class. Other points to be considered in connection with the choice of metals are:

1. The degree of purity obtainable commercially.
2. Resistance to oxidation at the temperature of normal working.
3. Freedom from the formation of an oxide skin of sufficient strength to hold up the metal when molten.
4. The non-arcing properties of the metal vapor.
5. The characteristics on disruption as to the formation of heavy vapors, the degree of scattering of the molten particles of metal, and their condition as to temperature, etc.
6. The contact difference of potential between the fuse metal and the terminals.
7. The coefficient of expansion of the fuse metal relative to that of the terminals or binding screws.
8. The form in which the metal is available whether in wire or strip, and its capability of being soldered satisfactorily.

Rating.—The normal fusing current for the materials sanctioned should be carefully determined for the requisite ranges, and the fuses stamped with the normal carrying capacity, and the fusing current and "sensitiveness" expressed as the percentage overload at which fusion takes place, the overload being reckoned as excess over the normal carrying capacity. The time should be specified within which the fuse must blow when started cold with the specified overload; this time will, of course, vary with the capacity of the fuse, and will be greater for inclosed fuses than for the open type.

Testing.—Arrangements should be made for standardizing the conditions and details of the following tests:

1. Normal fusing current.
2. Short circuits.
3. Arcing on fusion with currents slightly in excess of the normal fusing current.
4. Temperature rise for inclosed fuse covers.
5. Insulation between parts.

The normal fusing current for a wire may be defined as the minimum current required to fuse the wire in such a time interval as shall be necessary for the wire to have attained its maximum steady temperature. In order to obtain accurate results, sufficient time must be allowed for this to occur; for open type fuses a method of procedure can be detailed which will insure this, but for semi-inclosed and inclosed fuses the time interval necessary to bring them up to a given temperature will depend upon the special environment of the wire.

Contacts.—There are as a rule two sets of contacts to be considered:

1. The contact between the fuse wire or strip, and the end plate or ferrule of the holder or cartridge.
2. The contact between the end plates or ferrules of the holder and the clip jaws or terminals of the fuse block.

In some fuses of open type for fairly large currents, where the strip employed is of sufficient strength, it is forced edgeways between the spring terminal clips by means of an insulated grip handle, which can be removed when the fuse strip is in position, thus obviating one of the sets of contacts mentioned above. With regard to the contacts on the holders in the inclosed type, the fuse metal is usually soldered to the end caps, while in the open type it is usually held under a screw and washer. Where the fuse metal has approximately the same co-efficient of expansion as the terminal, not much trouble is experienced, particularly with strip, but where the expansions are different, flattening of the wire may occur, and a loose contact will be developed. Where one of the metals is highly electro positive to the other, local action will take place in damp situations, with consequent corrosion at the contacts. The form of contact between the fuse holder and the fuse block requires careful consideration; the knife blade and spring clip seems the most promising, as it is simple in construction and avoids the use of screwdrivers for replacement or disconnection, and it will, further, not become loose under working conditions. The only point against it is that it rather lends itself to abuse by the substitution of a strip of metal or wires in place of the fuse holder, but this could doubtless be overcome by a suitable arrangement of the block and terminals.

The spacing of the fuses should also be detailed, so as to secure a minimum distance between terminals of the same polarity, to allow of safe and easy handling. For fuses of the open type, incombustible septa of insulating material should be fixed between the fuses to limit the spread of the molten metal; the arrangement should also be such as to prevent accidental short circuit between live metal parts of opposite polarity. Open type fuses should preferably be arranged horizontally rather than vertically, as this is less likely to persist; the normal fusing current will, however, be increased by about 5 per cent.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Akron (O.) Gas Company's properties are now under control of a receiver, in the person of Mr. A. B. Eilbeck, who has been directing the Company's affairs as Manager for some time. The Company is one of those in which Mr. John R. Walsh, of Chicago, is largely interested, but the receivership appointment may not be construed as a declaration that the Company is actually insolvent.

THE following letter from Mr. A. B. Slater, forwarded to us from Fort Wayne, Ind., under date of the 23d inst., puts the matter under consideration plain enough so that no further misunderstanding can occur:

To the Editors AMERICAN GAS LIGHT JOURNAL: On my recent return from Brazil, in order to learn what had transpired in the gas industry in the United States during my absence, I naturally turned first to the pages of the AMERICAN GAS LIGHT JOURNAL, and noticed in the issue of October 9th a note mentioning my departure for Brazil, and in the issue of the 23d I found another notice the wording of which was evidently made up under a misapprehension as to my business connections, as it stated that some of my trips were in the interest of the Western Gas Construction Company. As I completely severed my connection with the Western Gas Construction Company at the end of September, the statement that I traveled in their interests was in error, as since the 1st of October I have had no connection, open or secret, with any construction company, but have been devoting my time entirely to my own business as consulting engineer. From your article the inference that I was still connected with the Western Gas Construction Company, I have found to have reacted seriously on my business, as some of my clients have seriously questioned whether my recommendations might not be biased by my connection with them, and as I know full well that you would never permit any statement in

error to in any way handicap or inconvenience your friends, I hope that you will kindly insert a note in the JOURNAL, noting that you were misinformed as to my connection with the Western Gas Construction Company, and stating that since the 1st of October I have had absolutely no connection with them whatever, but am entirely independent of all construction companies.

THE annual meeting of the Hartford (Conn.) Gas Securities Company will be held in that city at 2 P.M. to-morrow.

THE proprietors of the Albion (Mich.) Gas Light Company have declared a semi-annual dividend of 2½ per cent.

MR. LOUIS D. KELSEY, writing from Kansas City, Kas., under date of December 23d, says that the Brookfield (Mo.) Gas, Electric and Heating Company has no connection with the El Reno (Okla.) gas and electric lighting interests' reorganization.

THE Goshen (Ind.) Gas Company has reduced its net selling rate on all accounts to $1 per 1,000 cubic feet.

MR. H. T. HARVEY, Secretary of the El Reno Gas and Electric Company, of El Reno, Okla., writing to us under date of December 21, says:

"To the Editors AMERICAN GAS LIGHT JOURNAL: I notice in your last issue of the JOURNAL, bearing date of December 18th, that you made reference to the change in ownership of the El Reno gas plant and the electric lighting plant, and it is simply to correct the statement that the following information is given. Messrs. Milo D. Campbell, of Coldwater, Mich.; C. A. Wilson, Holly, Mich., and Dr. H. T. Harvey, of Battle Creek, Mich., built a modern and up-to-date coal gas plant in El Reno in 1904. The ownership of that property continued with these gentlemen until December 1st, 1905, at which time they negotiated for the purchase of the electric lighting plant owned by the Union Light and Power Company, of this city, and associated with them the following gentlemen, all from Michigan, with the exception of Mr. H. H. Stephens, who has been the Manager of the Brookfield (Mo.) Gas Company, and who will assume the management of the El Reno consolidated plants: R. E. Clarke, Morris G. Clarke, R. J. Byers, H. C. Loveridge, ex-Congressman D. D. Aitken, Hon. D. P. Markey, R. B. Thayer, and Dr. J. A. Hatchett, and Messrs. F. N. Howell and E. D. Humphrey, of El Reno. The purchase price of the electric lighting plant was $69,400." We might add to the above that Mr. Harvey the representative head of the Michigan capitalists will return to Battle Creek, Mich., where he proposes to employ his time in the purchase and consolidation of other properties.

MR. GODFREY L. CABOT, writing to us from Boston, Mass., under date of the 25th of December, says:

To the Editors AMERICAN GAS LIGHT JOURNAL: Referring to a discussion on high pressure gas distribution in your issue (page 1054) for December 25th I find therein stated that the 15-pound, 6-inch pipe used with a Dresser coupling costs 36.3 cents per foot, making a saving of $9.81 per joint over the regular screw pipe. I beg to call your attention to the fact that 6¼-inch, 13-pound casing with screw threads is being bought by me at the present time for 33 cents a foot delivered, which makes the cost of this casing much cheaper than the plain end casing. In the natural gas regions it is usual to use a screw pipe or screw casing up to and including 6-inch, and from 8-inch up to use the plain end pipe. I would be glad of figures from some of your numerous readers as to the relative leakage in the screw pipe and the screw casing as compared with plain end pipe and Dresser coupling; for that is perhaps a more important question than the difference in price.

THE Power and Mining Machinery Company asks us to announce that Mr. Robert T. Lozier has been appointed District Sales Manager of its gas machinery department. His headquarters are in 52 William street, New York.

FROM all accounts the third annual muskrat carnival of the Monroe (Mich.) Yacht Club, which was brought off in the Armory, Monroe, the evening of last Thursday, was a "great affair." Commodore Charles G. Greening and other gas men had their fair chance at the "rats."

THE December issue of *Gas News*, which is published at the instance of the Public Service Corporation, of New Jersey, is a very interesting one.

A RESOLUTION introduced in the City Council, Albany, N. Y., by Ald. Shelley, declaring that the gas supplied by the Municipal Gas Company was not up to standard, and that a petition be lodged with the State Commission on Gas and Electricity for an examination on such account, was referred to the law committee.

THE authorities of Dothan, Ala., are inviting proposals for the construction of a gas plant, the competition to close to-day.

IT is said that a gas works is to be constructed at Marseilles, Ills., and that the prime movers in the venture are Messrs. V. J. Duncan and J. J. Joy, of Ottawa, Ills.

THE new coal gas plant of the Monmouth (Ills.) Gas and Electric Company is in successful operation.

THE annual meeting of the shareholders in the New Haven (Conn.) Gas Light Company will be held to-morrow. There is no likelihood that any change will be made in its executive management.

IT is said that the Van Brunt-Jackson syndicate is anxious to purchase the controlling interest in the Augusta (Ga.) Gas Light Company now owned by Col. Dyer. Other people have attempted that purchase, but the "Col." knows a good thing, and when he parts with such he usually gets his price.

DES MOINES, IA., to-day and hereafter will get its supply of artificial gas at the rate of $1 per 1,000 cubic feet, a concession of 10 cents per 1,000.

THE Suffolk Lighting Company, through Mr. George McDonald, of New York, has made application to the Village Board of Amityville, L. I., for the right to supply gas therein.

THE proprietors of the Worcester (Mass.) Gas Light Company have authorized the announcement that beginning to-day the gas rate will be put at $1.10 per 1,000 cubic feet, with a discount of 20 cents per 1,000 cubic feet on all bills paid on or before the 15th day of the month in which they become due. Good for Worcester.

THE foundation stone of the new building of the Engineers' Club, on West Fortieth street, New York City, opposite Bryant Park and the new public library, was laid December 24 by Mrs. Andrew Carnegie, whose husband, standing by, declared the task well and truly done. The ceremony was quite informal, but the Club was well represented by its officers and committees, including President W. H. Fletcher, Past President John C. Kafer and Charles Haswell, the veteran engineer, now in the 96th year of his age. The architects, Whitfield and King, were also present. Fortunately the weather cleared during the afternoon and thus the party was enabled to inspect the building, now up to the ninth story in the steel work and to the third in marble and brick casing. The records deposited in the stone included a Bible of 1905, a club book of 1905, copies of the *Herald*, *Tribune*, *Sun* and *Times* of December 23; a copy of the certificate of incorporation; a booklet of the old club house at 374 Fifth avenue; a half dollar, quarter dollar, dime, nickel and 1 cent; a card of W. L. Crow, the builder; a copy of Mr. Carnegie's letter of gift to the Engineers' Club; a chronological history of the Club; a list of members elected since the publication of the Club book this year; a list of the incorporators of the Club; the programme of competition for the selection of architects for the two buildings and floor plans of the new house.

IN a paper read recently before the Engineering Society at Huddersfield, England, Mr. Alfred W. Bennis, M.I.Mech.E., called attention to the many sources of waste and inefficiency commonly met with in the boiler house. Engineers who spare no pains in reducing the steam consumption of their engines often neglect to assure themselves that the steam used is generated as economically as possible, forgetful of the fact that almost the entire field for saving in a modern steam plant lies behind the stop valve. Beginning at the chimney end of the plant, Mr. Bennis said that the height of the chimney should lie between 120 feet and 180 feet, giving a natural draught of from 0.55 inch to 0.82 inch of water, with an average temperature of 300° F. For full-sized Lancashire boilers the chimney area should equal 6 square feet per boiler up to a total of 4 boilers, and 5 square feet more should be allowed for every additional boiler. The chimney entrance should be 10 per cent. greater than this, and the flue should enter the chimney with an upward slope of 45°. The area through the economizer should exceed the flue area by about 20 per cent., and the economizer walls should be 14 inches thick and particularly well built. The minimum combined area of the boiler side flues ought not to be less than double that of the main flue. Mr. Bennis would have a fuel calorimeter in every boiler house equipment, and a fuel test entered weekly along with the coal and water consumption in the log book. It is often the case that a cheap fuel has more heating value than a dearer class, as the price is influenced to a considerable degree by the convenience with which it can be burnt. A high-class mechanical stoker will burn coal which it is almost impossible to fire by hand, so that with such machinery a large reduction may often be made in the fuel bill. Another valuable adjunct is a CO_2 recorder for checking the firemen's work by analysis of the waste gases. The proportion of CO_2 should, of course, be as high as possible, always provided that enough air must be admitted to prevent the escape of CO. Usually there is a danger of the production of CO if the proportion of CO_2 is above 15 per cent. Mr. Bennis claimed that using an economizer, superheater and mechanical stoker, as much as 85 per cent. of the heat of the coal could be utilized, only 15 per cent. being lost in radiation or carried away by the flue gases. He believed in working furnaces at the highest temperatures obtainable, provided the heat was kept uniform.

THE AMERICAN GAS LIGHT JOURNAL

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The Market for Gas Securities.

The situation in respect of local gas shares, on the surface at least, as between the two last weeks of the old year, is all in favor of the finish. Consolidated sold at the close to-day (Friday) at 181, which makes a good gain for the week, especially when one remembers that the stock is ex-dividend now. In due time the investors in New York State gas securities will understand the advantages of the Commission.

Brooklyn Union is at the figures last quoted, but we believe it can be truthfully said that it should be much higher, considering the volume of business that the concern is doing. Peoples, of Chicago, is again well above par, and Cincinnati Gas and Electric, on the knowledge that the Company will distribute natural gas on its own account, is booming. The dividends on the common and preferred shares of the Standard Gas Light Company, New York, are payable to-morrow.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JANUARY 1.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Cap tal.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	181	182
Central Union, Bonds, 5's	5,000,000	1,000	108	110
Equitable Bonds, 6's	1,000,000	1,000	..	105
" 1st Con. 5's	2,300,000	1 000	118	120
Mutual	3,500,000	100	275	290
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.. Bonds, 5's	11,000,000	1,000	111	114
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg Gold Bds. 5 p. ct.	1,000,000	..	98	104
Northern Union, Bonds, 5's	1,250,000	1,000	105	107
New York and East River Bonds 1st 5's	3,500,000	1,000	112	114
" 1st Con. 5's	1,500,000	..	106½	108½
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
Bonds, 1st Mortgage, 5's	1,500,000	1,000	111	114
Yonkers	999,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	175	185
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	⅝	..
" ncome Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000.000	1.000	47½	50
Buffalo City Gas Co.	5,500,000	100	10	12
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co	29,500,000	100	108	108½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,026,500	100	107½	108
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	82	85
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	380,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000		101
Essex and Hudson Gas Co.	6,500,000	..	39	40
For Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	110	110½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100		..
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	108½	109
Lafayette Gas Co., Ind	1,000,000	100	..	60
Bonds	1 000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	100¾	101
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2d "	2,500,000	1,000	104	.
Rochester Gas & Elec. Co.. Preferred	2,150,000	50	88	..
Consolidated 5's	2,150,000	50	118	..
San Francisco, Cal	2,000,000	..	104½	105½
St. Joseph Gas Co. " 1st Mtg. 5's	16,800,000	100	58½	58¾
St. Paul Gas Light Co	751,000	1,000	92	..
1st Mortgage 6's	1,500,000	100	45	47
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General Mortgage, 5's	600,000	1,000	112½	115
Syracuse, N. Y.	2,465,000	1,000	96¾	..
Bonds	1,975,000	100	50	55
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First mortgage 6's	2,600,000	20	298½	299½
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Wilmington, Del	4,000,000	..	..	..
	600.000	50	230	..

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DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Dec. 13, 1905.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Jan. 15th 1906, to stockholders of record at the close of business December 30, 1905. Checks will be mailed.

1593-4 LEWIS LILLIE, Treasurer.

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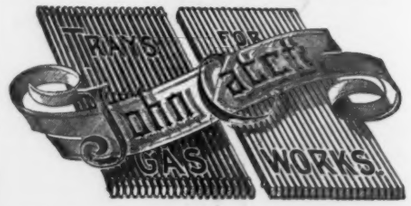

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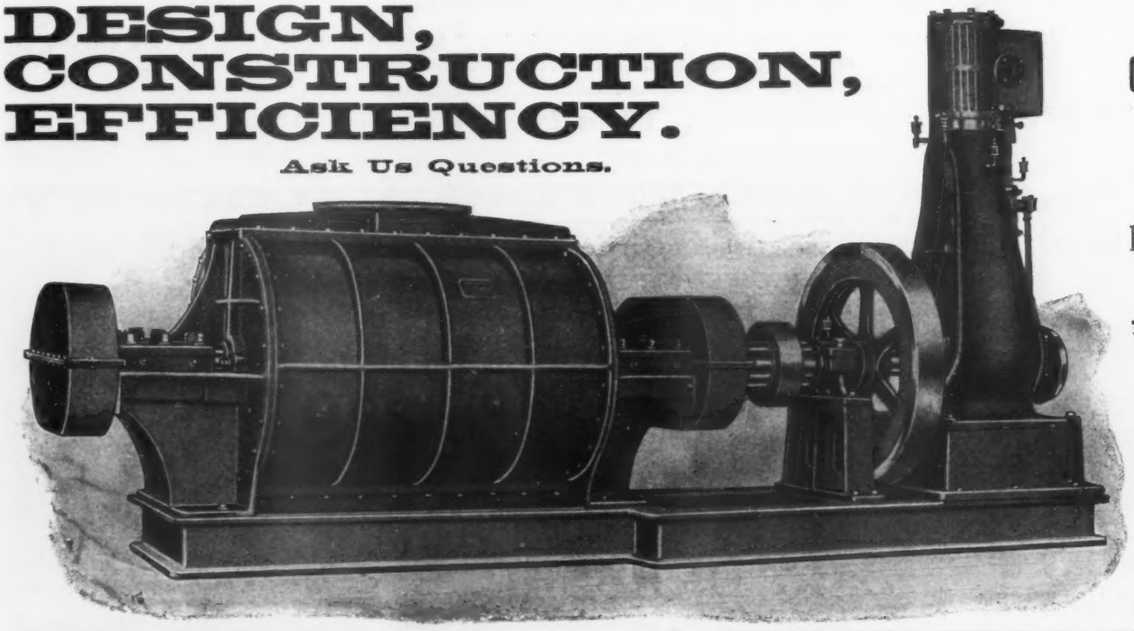

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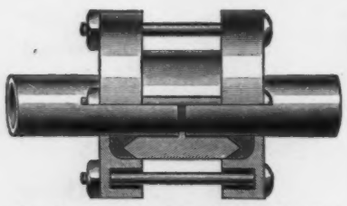

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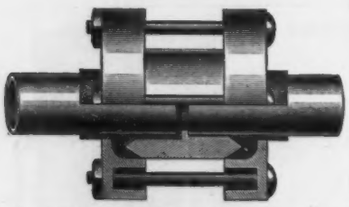

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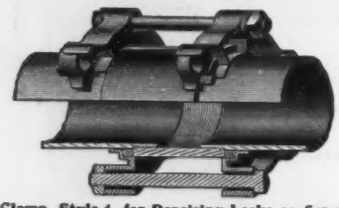
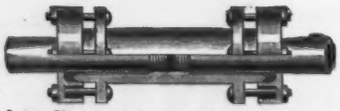


Clamp, Style 4, for Repairing Leaks on Screw Collar.



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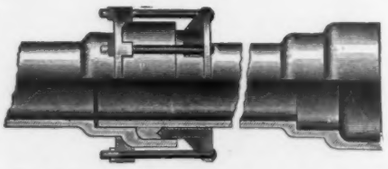

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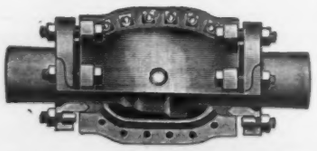

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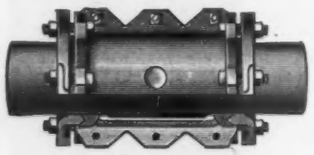

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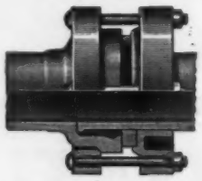

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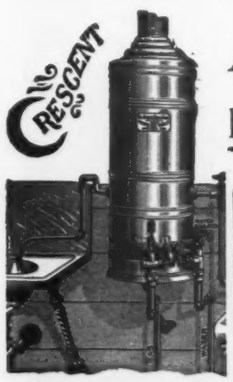

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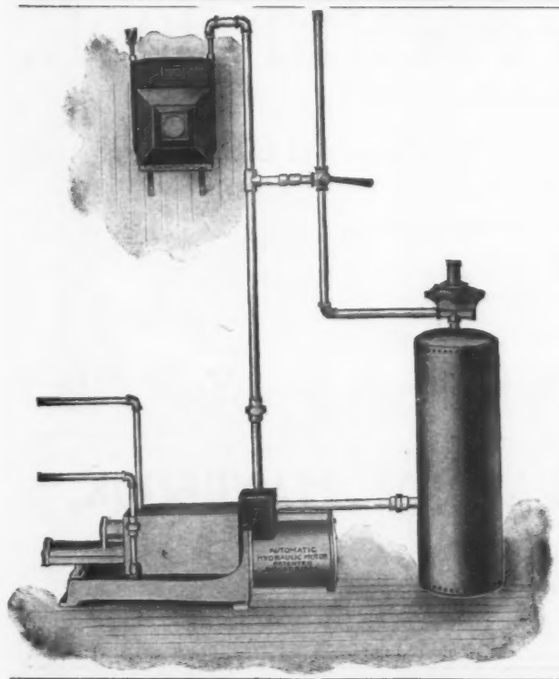

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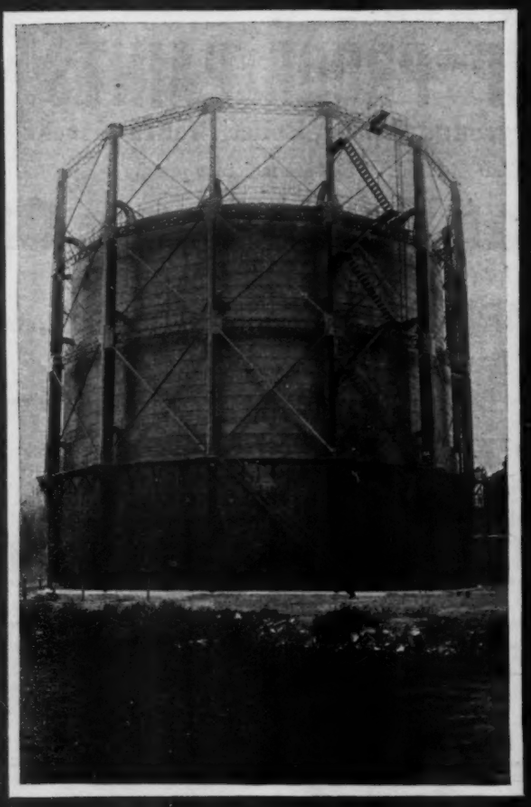

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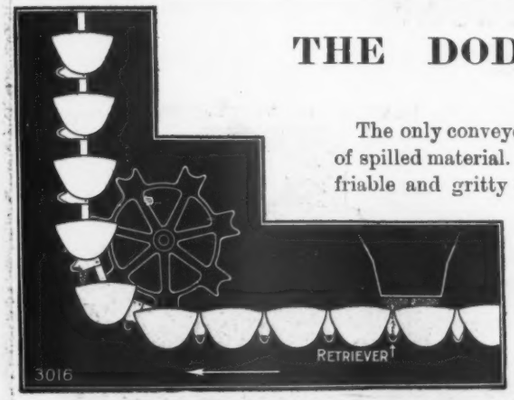

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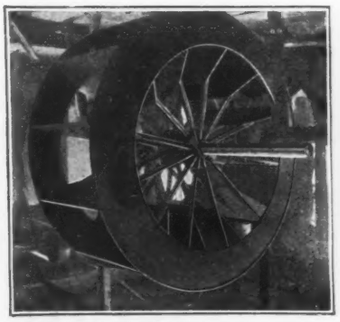

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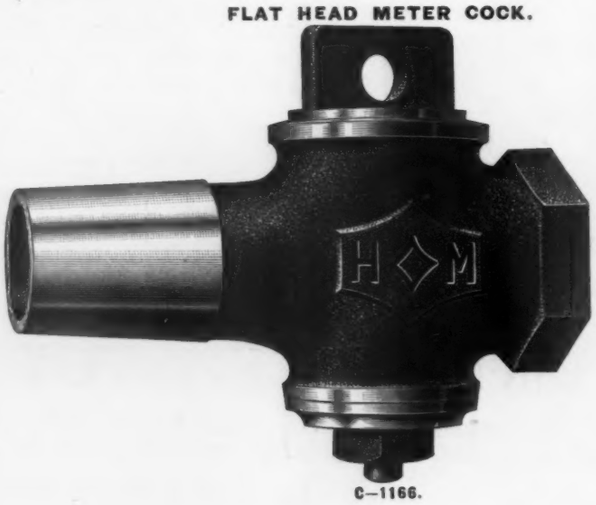

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THOUSANDS IN USE WITH INCANDESCENT BURNERS.
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821-823 Eagle Av., N.Y.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE.
Plans prepared and Estimates furnished at short notice.
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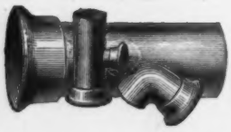
238 Java Street, Brooklyn, N. Y.

WARREN FOUNDRY AND MACHINE CO.,
Established 1856. Works at Phillipsburgh, N. J.
New York Office, 160 Broadway.



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FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF
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For Shutting Off Gas in Mains
Temporarily during alterations and repairs. : : : :
Any size gas main can be shut off in 30 seconds. : : :

STOPPERS SENT ON TRIAL.
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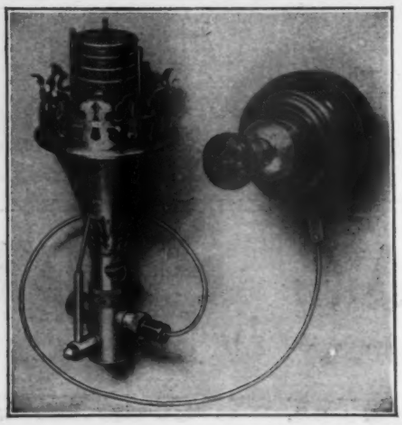

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BEATS
ELECTRICITY in CONVENIENCE,
MAKES
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PERFECT.
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THE PURIFIED GAS REVIVES THE FOULED OXIDE.

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OPEN TOP CARRIER.
ESPECIALLY ADAPTED FOR HANDLING
Coal, Coke, Ashes, Stone, Ores,
Or any heavy or gritty materials, where strength and durability are essential. Constructed in any length or capacity, and to suit local conditions.
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AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

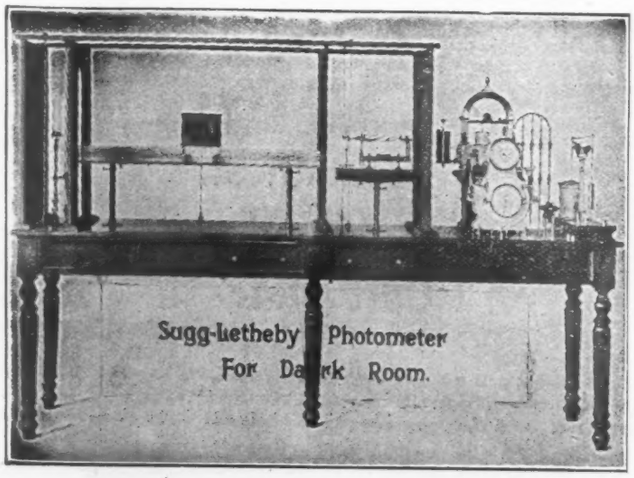
JANUARY, 1906.

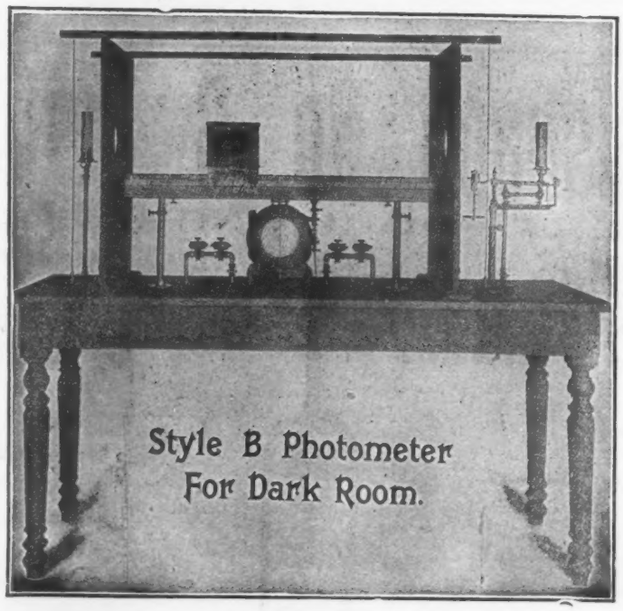
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Mon.	1	10.40 PM	6.20 AM
Tue.	2	11.40 FQ	6.20
Wed.	3	12.40 AM	6.20
Thu.	4	1 30	6.20
Fri.	5	2.30	6.20
Sat	6	3.20	6.20
Sun.	7	4.20	6.20
Mon.	8	5.10	6.20
Tue.	9	No L.	No L.
Wed.	10	No L. FM	No L.
Thu.	11	No L.	No L.
Fri.	12	5.20 PM	8.10 PM
Sat.	13	5.20	9.10
Sun	14	5.20	10.20
Mon.	15	5.30	11.30
Tue.	16	5.30	12.40 AM
Wed.	17	5.30 LQ	1.40
Thu.	18	5.30	2.50
Fri.	19	5.30	4.00
Sat.	20	5.30	5.10
Sun.	21	5.40	6.20
Mon.	22	5.40	6.20
Tue.	23	5.40	6.20
Wed.	24	5.40 NM	6.20
Thu.	25	5.40	6.20
Fri.	26	5.40	6.20
Sat.	27	5.40	6.20
Sun.	28	5.40	6.10
Mon.	29	9.30	6.10
Tue.	30	10.20	6.10
Wed.	31	11.20	6.10

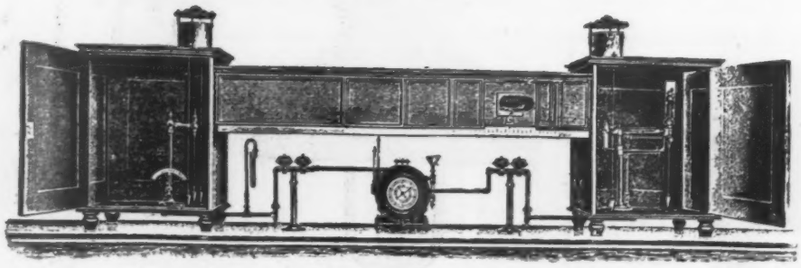
TOTAL HOURS DURING 1906.

By Table No. 1.

	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

JANUARY, 1906.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light	Extinguish.
		P. M.	A.M.
Mon.	1	4.30	6.30
Tue.	2	4.30	6.30
Wed.	3	4.30	6.30
Thu.	4	4.30	6.30
Fri.	5	4.30	6.30
Sat.	6	4.30	6.30
Sun.	7	4.30	6.30
Mon.	8	4.40	6.30
Tue.	9	4.40	6.30
Wed.	10	4.40	6.30
Thu.	11	4.40	6.30
Fri.	12	4.40	6.30
Sat.	13	4.40	6.30
Sun.	14	4.40	6.30
Mon.	15	4.50	6.25
Tue.	16	4.50	6.25
Wed.	17	4.50	6.25
Thu.	18	4.50	6.25
Fri.	19	4.50	6.25
Sat.	20	4.50	6.25
Sun.	21	4.50	6.25
Mon.	22	5.00	6.25
Tue.	23	5.00	6.25
Wed.	24	5.00	6.25
Thu.	25	5.00	6.25
Fri.	26	5.00	6.25
Sat.	27	5.00	6.25
Sun.	28	5.00	6.25
Mon.	29	5.05	6.15
Tue.	30	5.05	6.15
Wed.	31	5.05	6.15

TOTAL HOURS DURING 1906.

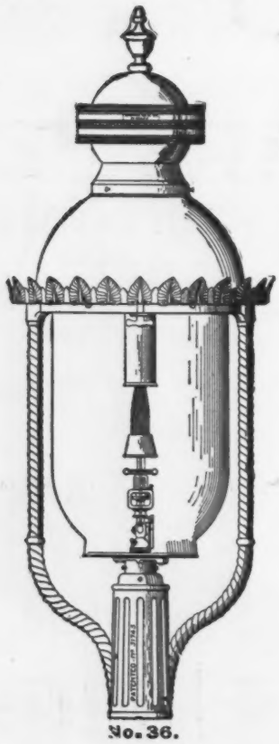
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON. 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 36.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

The Welsbach No. 6 Harp Fixture.

AN IDEAL LIGHT FOR DINING OR LIVING ROOMS.

THE HIGHEST MECHANICAL INGENUITY COMBINED WITH ORNAMENTAL BEAUTY--THE NEWEST OUTPUT FROM THE WELSBACH FACTORIES.

Equipped with new model No. 66 high candle power Welsbach Burner.

Side Pilot By-pass Tube covered with refractory sleeve to prevent bending.

Fourteen-Inch Opal Dome Shade.

Polished Brass Embossed Crown 2¼ inches high.

Length of Fixture, 30 inches.

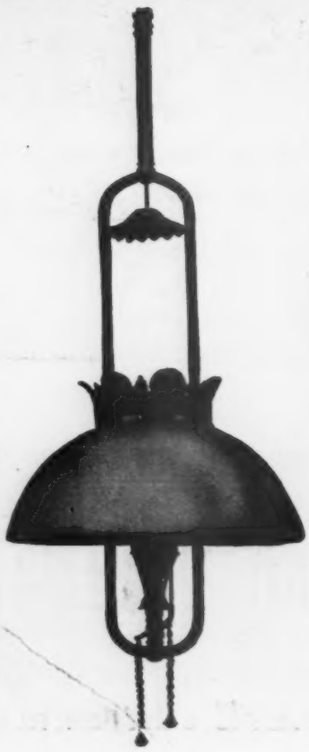
Width of Harp, 4½ inches.

Finished in Polished Brass.

Packed One Dozen to the Case.

List Price, per Dozen, $45 00.

We recommend equipping the No. 6 Harp Fixture with No. 4197 Intensive Brand Mantle, and the No. 306 **F. Q. M.** Clear Glass Air-Hole Cylinder.



Although the 14-inch Opal Dome Shade is standard equipment, we are prepared to furnish Dome Shades in green, pink or yellow (opal lined), and will be glad to quote prices.

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Salesrooms in all the principal cities of the United States.

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For the Period Ending July 1st, 1905, has been Awarded Contracts for 32 Sets of

Standard Double-Superheater Lowe Water Gas Apparatus.

PARTIAL LIST OF PLACES:

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Detroit, Mich. (2d contract).	**New Britain, Conn.**	**Hamilton, O.** (2d contract).
Springfield, Ills.	**Ludington, Mich.**	**Indianapolis, Ind.** (2d contract).
Oneonta, N. Y. (2d contract).	**New York,** Mutual Co. (2d contract).	**Hazleton, Pa.**
Pottsville, Pa. (2d contract).	**St. Louis, Mo.** (4th contract).	**Mahanoy City, Pa.**
Evansville, Ind. (2d contract).	**Sioux City, Ia.** (3d contract).	**Nanticoke, Pa.**

TOTAL SETS TO JULY 1ST, 1905, ... 585
TOTAL DAILY CAPACITY TO JULY 1ST, 1905, . 455,980,000 CU. FT.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas.
H. D. ABERNETHY, Sec.

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Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

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Brooklyn Fire Brick Works,

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SPECIAL HIGH GRADE REFRACTORY MATERIAL FOR BENCH SETTINGS AND WATER GAS LININGS.

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CHRISTY SETTINGS.

CORRESPONDENCE SOLICITED.

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An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 36th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by
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Modern Coal Gas Benches,

With either Horizontal or Inclined Retorts, Half-Depth and Full-Depth Recuperative Furnaces.

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STANDARD BENCH IRONWORK.

Linings for Water Gas Apparatus, High Grade Fire Brick of All Shapes and Sizes, Ground Fire Clay, Ground Fire Brick in Bulk or in Barrels.

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BENCH SETTINGS,

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A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

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HALF AND FULL DEPTH AND FREE FIRING BENCHES,

All styles of which we have in operation, equipped with the BEST of LATEST IMPROVEMENTS, proving our claim for SUPERIOR QUALITY and EFFICIENCY.

INCLINES—We have in SUCCESSFUL OPERATION benches of Inclined Retorts, MANUFACTURED and ERECTED by us.

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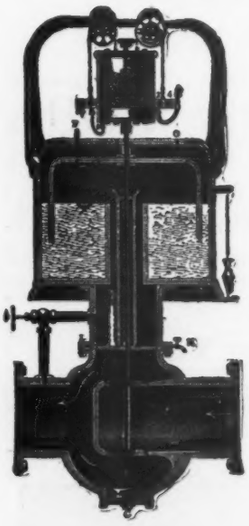

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INSTALLATION OF SMOKELESS TAR BURNING SYSTEM,

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For the Year 1904.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 36th Year of Publication.

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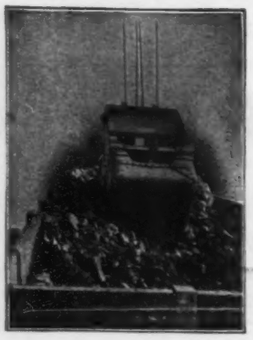

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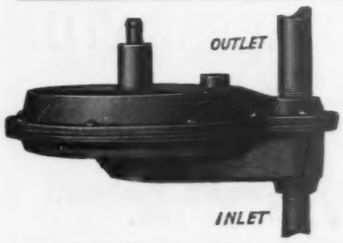

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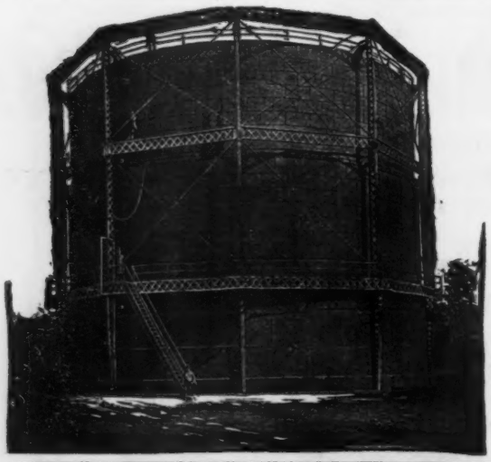

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APPARATUS FOR COAL GAS PLANTS,

SINGLE AND DOUBLE-LIFT GASHOLDERS AND STEEL TANKS,

Latest Improved

ROTARY EXHAUSTERS, P. & A. TAR EXTRACTORS, AMMONIA WASHERS,

CONDENSING, SCRUBBING AND PURIFYING APPARATUS.

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COX'S HIGH-PRESSURE FLUID DISCHARGE COMPUTER.

This Computer solves the following formula, which is applicable to Gas, Air and other elastic fluids, flowing through long pipes with high initial pressures:

$$\text{Discharge in cubic feet per hour at atmospheric pressure} = 33.3\sqrt{\frac{d^5 \times (p_i^2 - p_s^2)}{L \times w}}$$

Where d = diameter of pipe in inches,
p_i = absolute initial pressure in pounds per square inch,
p_s = absolute terminal pressure in pounds per square inch,
L = length of pipe in miles,
w = specific gravity of the fluid when air = 1.

To Find the Discharge from a Pipe and the Required Size of Pipe.

(1.) Set the specific gravity of the fluid opposite the length of pipe;
(2.) Bring the DIFFERENCE of the initial and terminal gauge pressures opposite the SUM of the initial and terminal gauge pressures;
(3.) Opposite any diameter of pipe will now be found the discharge in cubic feet per hour at atmospheric pressure; and
(4.) Opposite any desired discharge will also be found the required diameter of pipe.

Price of the Computers, in Cloth Case, 6½ x 8 inches, $5 Each, Net.

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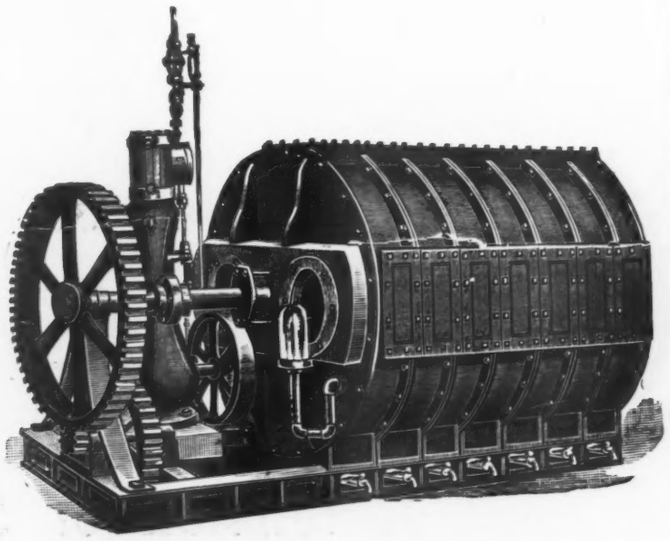

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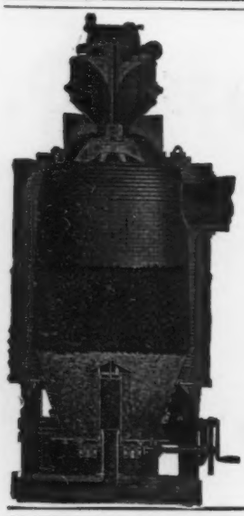

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These valves are provided with double discs or gates, and are tight with the gas pressure on either side of them.

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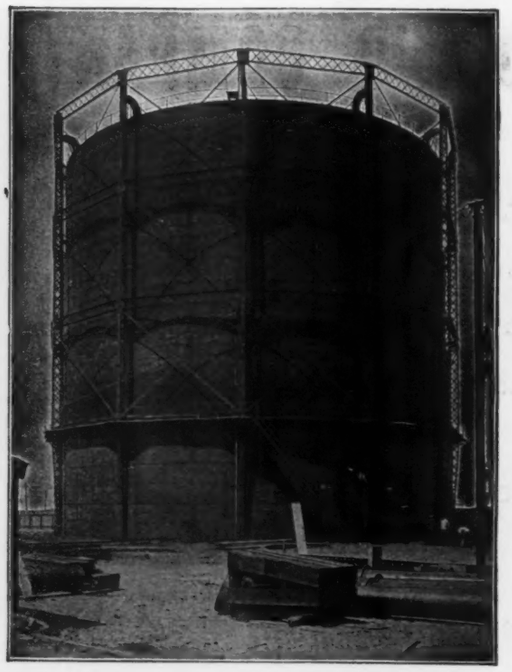

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The gas registered agrees absolutely with the amount purchased by the coin.

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They can be changed to Prepayment, Prepayment and Beal Straight-reading, or Beal Straight-reading only. Good job. Good time. Good people. Write us.

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Wet and Dry Gas Meters, Station Meters, Meter Provers,
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EXCERPTS FROM DECISIONS

—OF THE—

BOARD OF GAS COMMISSIONERS of the COMMONWEALTH OF MASSACHUSETTS.

MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir: I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

I note that most of these extracts are broad and safe guiding precepts, which apply with equal force to one Company as to another. The 13 years' existence of the Board of Gas Commissioners, with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations and rights of Gas Companies. Your little book will serve as a valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

Yours truly, (Signed) F. C. SHERMAN, Superintendent.

☞ A 28-page Pamphlet, containing the cream of this Board's decisions as to the proper management of Gas Companies.

Compiled by E. H. YORKE. Price, $1.00. Address,

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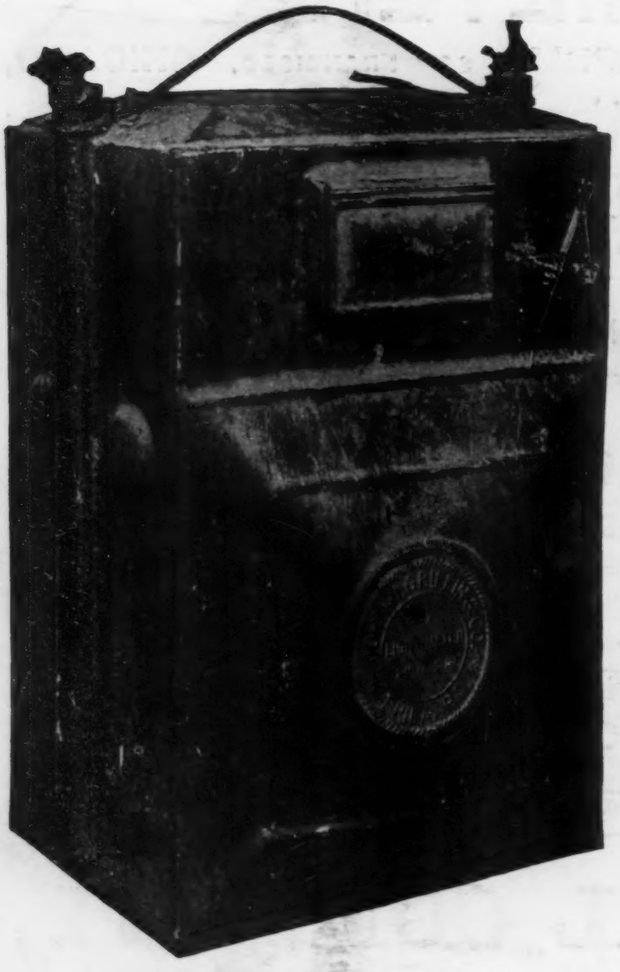
BEFORE.



This is a photograph of a 3-light regular meter out of a lot of meters received from the Coatesville Gas Co., Coatesville, Pa., to be repaired and converted into prepayment meters.

AFTER.

This is the same meter after it has been repaired and converted into a new prepayment meter.

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